ELECTRICAL WORLD

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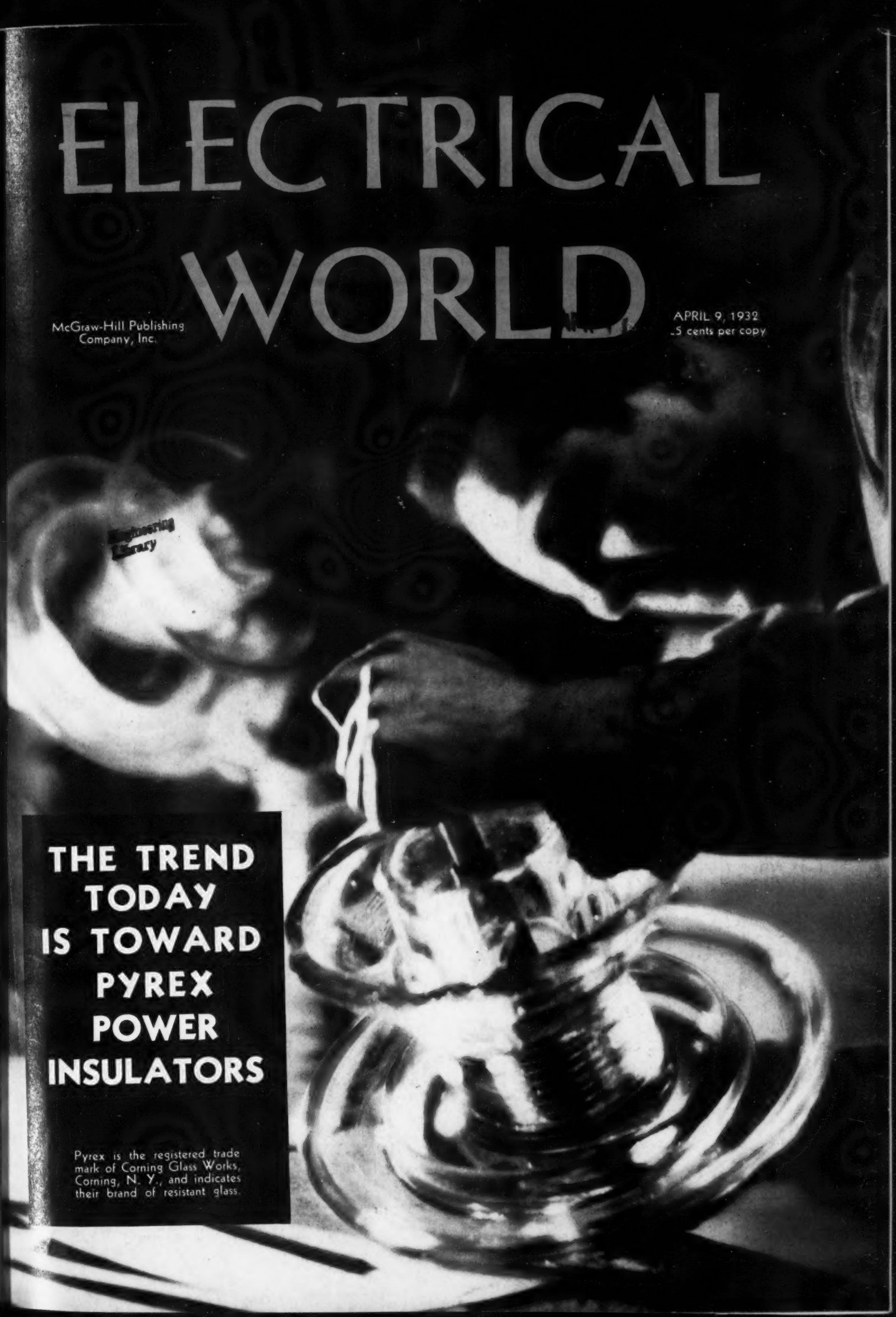

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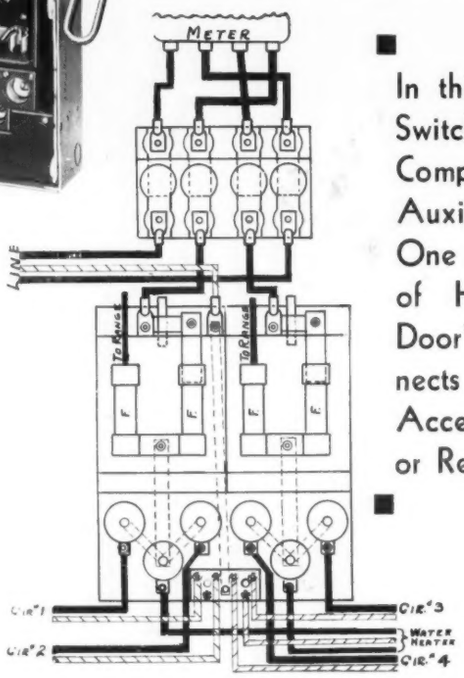

Wiring Diagram 277

In this Series of Murray Switches the Handle has Complete Switch and Auxiliary Cover Control. One Operation, Moving of Handle to "Open Door" Position, Disconnects and Makes Fuses Accessible for Inspection or Replacement.

Write for Range Switch Booklet

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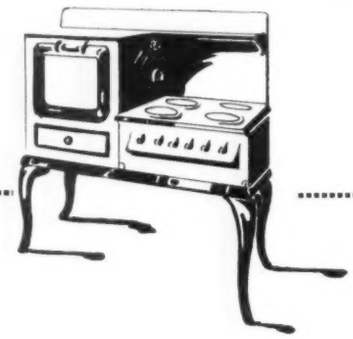
BROOKLYN · NEW YORK

SINCE 1899



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Send Booklet of Murray Range Switches

Name..... Company.....

Position..... Address.....

"ON" position showing distribution and water heater fuse compartment open.

"ON" position—main and range fuses not accessible until handle is in "OPEN DOOR" and service disconnected.

"OPEN DOOR" position — main fuses and range fuses accessible. Service disconnected.

ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

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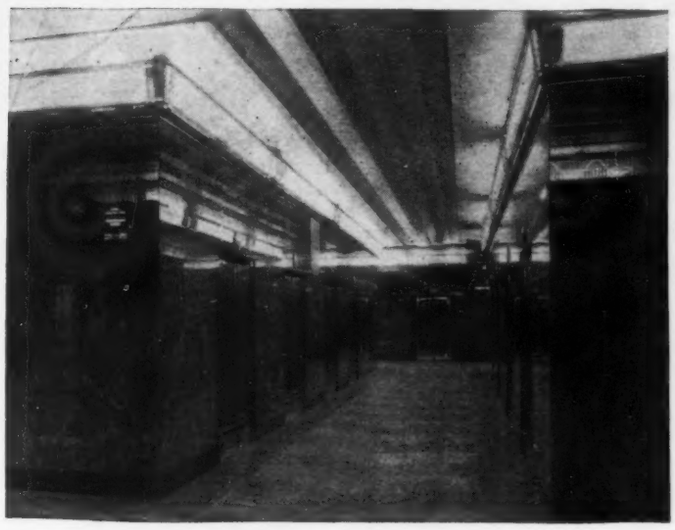

Elevator corridor lighting
Empire State Building
New York

APRIL 9, 1932

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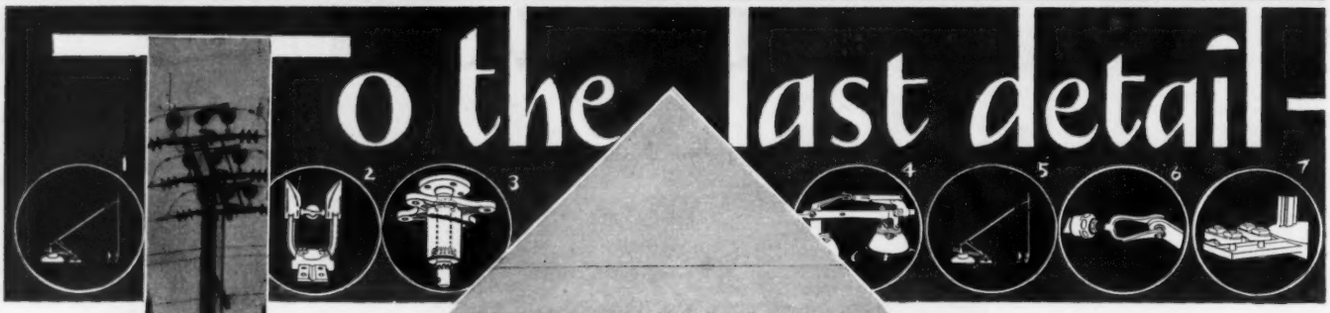

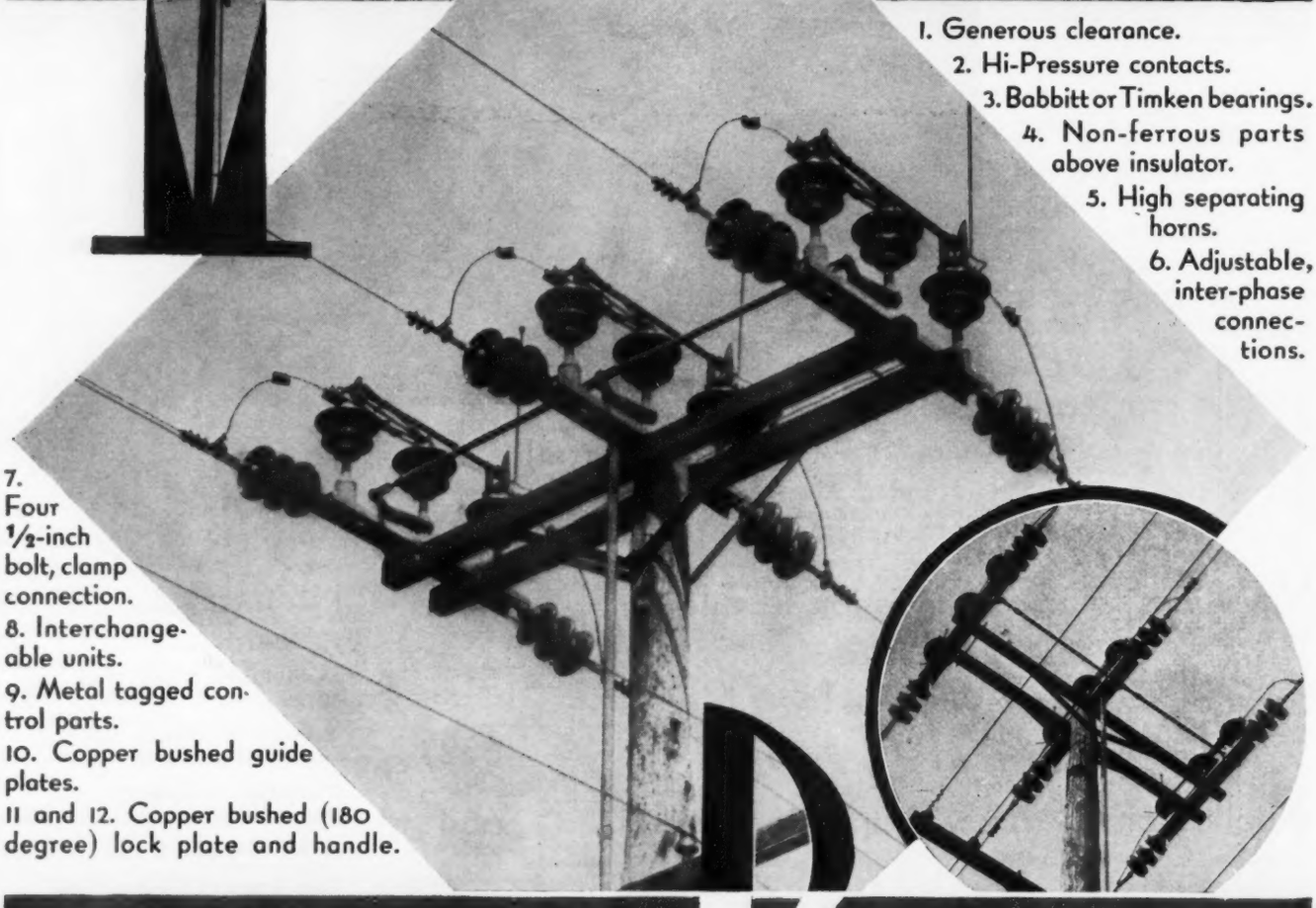

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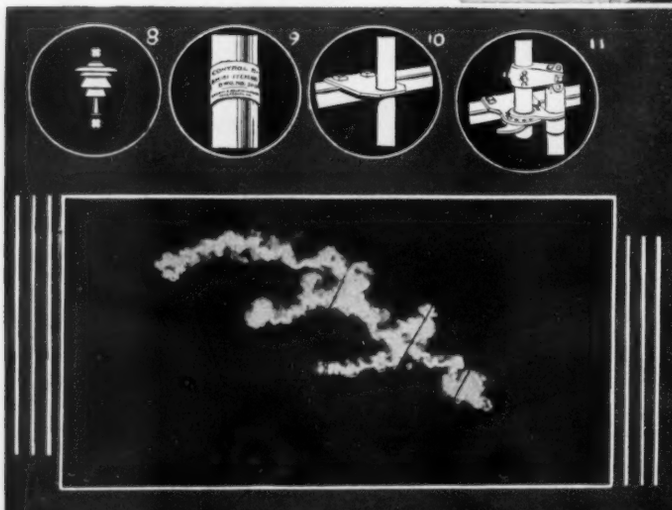

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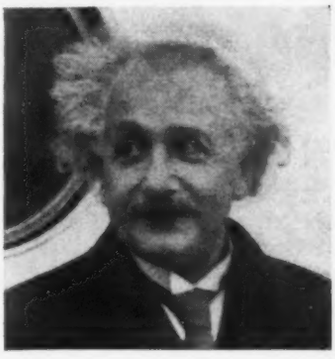


Sometimes the Americans are just children. You should see them flocking to see me, as if I were a miraculous animal. All this interest is very pleasant, but still sometimes can be inconvenient.

ALBERT EINSTEIN,
Mathematician, physicist.

[Herr Einstein arrives in Holland after spending some weeks in the vicinity of Hollywood and getting his fill of hero worship.]

Middle West may be reorganized

—**Insull confers with bankers** as to best way in which financial problems, including early maturity of serial 5 per cent notes, may be met. Stockholders left way open for reorganization—*p. 634.*

—**Studded boiler tubes offered** as a solution for some of the steam-plant engineer's difficulties. Self-renewing layer of refractory material constitutes the basic idea of development—*p. 643.*

Low-voltage overhead networks arrive

—**Light-weight protectors built** by Westinghouse, utilizing Deion-type breakers, make feasible in overhead construction the principles used in underground work. A revolution in distribution practices?—*p. 641.*

—**Radio City's power capacity** totals 13,000 kva. at the start. Four multi-bank transformer installations will be made and a number of special features of design included in America's new amusement center—*p. 656.*

—**You will regret the injustice,** is the warning which the president of the National Association of Railroad and Utilities Commissioners gives to the insurgents in that organization—*p. 635.*

—**Modern 138-kv. loop system,** the first to be provided with high-speed operation facilities, undergoes exhaustive tests involving more than 400 arcing and solid faults—*p. 643.*

Sell incomparable cooking, not ranges!

—**The range that nobody knows** offers wonderful possibilities in the development of the electrical age, but today industry men are scarcely aware of its virtues and the emotional sales appeal has not been made—*p. 663.*

—**Fair values rule in Vermont,** where the Public Service Commission bases its activities accordingly and therefrom rules on capitalization and rates for properties. Chairman Shaw explains his views—*p. 647.*

Line tests cover 260 service years

Insull Moves for Stabilization of Middle West Utilities

New York and Chicago bankers confer with him to formulate a plan of finance induced by early maturity of note issue.

FACED with a maturity of $10,000,000 on June 1 and a similar refunding problem each year up to 1935 for the 5 per cent serial notes of the Middle West Utilities Company, officials of the company have conferred with representatives of New York and Chicago banks. Samuel Insull visited New York on Thursday. Stockholders last week approved an amendment to the certificate of incorporation which modified their pre-emptive rights (ELECTRICAL WORLD, April 2, page 599).

Recapitalization plans, in their preliminary stage, are said to involve an arrangement whereby holders of the company's notes will receive new preferred stock and possibly some cash. It is expected also that common-stock holders will be asked to accept new stock for their holdings, but at what rate remains to be decided. It is also probable that preferred-stock holders will be asked to exchange their holdings.

While the immediate problem faced by the company is the meeting of the $10,000,000 in notes which will fall due on June 1, other problems are the early reduction of heavy bank loans carried by subsidiary companies and a scaling down of the share capitalization of the parent company. The latter faces the necessity of carrying $29,000,000 in bank loans or providing some method of refinancing.

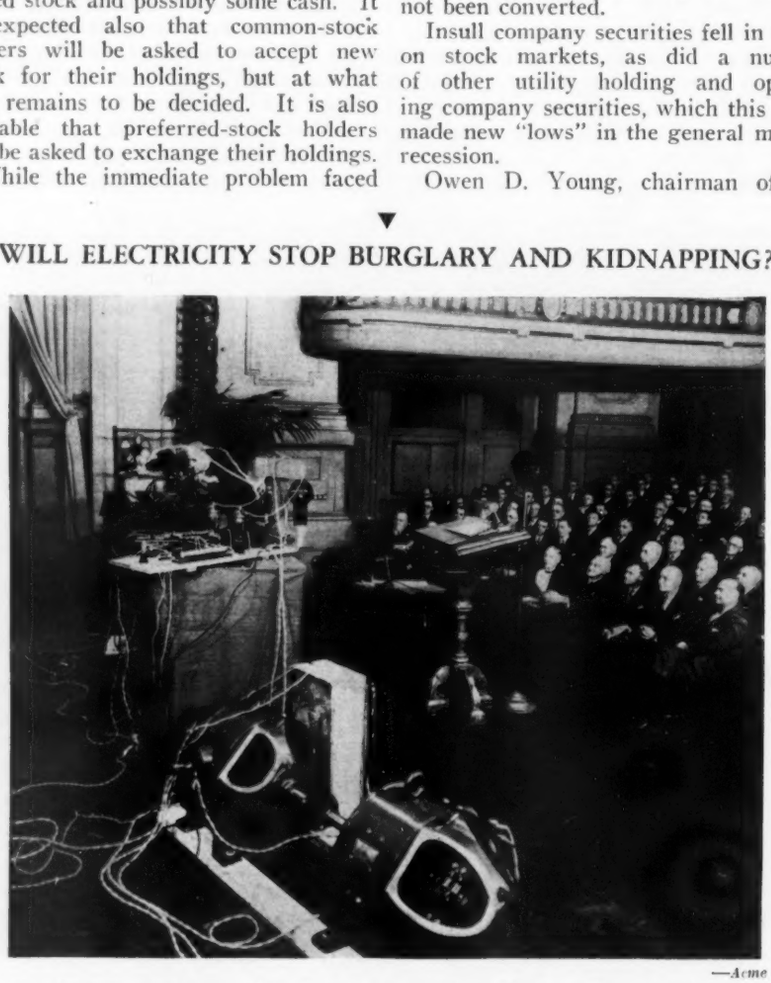
The plan of reorganization will probably call for a substantial paring down of the company's capitalization, which now consists of 15,641,983 shares of $10 par common stock, 607,396 shares of $100 par value convertible preferred stock and the $40,000,000 5 per cent serial notes, due annually at the rate of $10,000,000 from June 1, 1932, to June 1, 1935. There also were outstanding on December 31 63,016 shares of stock represented by scrip which had not been converted.

Insull company securities fell in value on stock markets, as did a number of other utility holding and operating company securities, which this week made new "lows" in the general market recession.

Owen D. Young, chairman of the board, General Electric Company, is reported to be co-operating with Mr. Insull in the formulation of recapitalization plans.

▼

WILL ELECTRICITY STOP BURGLARY AND KIDNAPPING?



—*Acme*

Dr. Phillips Thomas demonstrates to New York Railroad Club the use of the "electric eye" to trap an intruder, floodlight the room, sound an alarm, take the man's picture and render him helpless with a discharge of tear gas. The negative, taken by means of infra-red rays, was developed and projected on a screen within twenty minutes.

Companies That Withdrew in 1931 Rejoin N.E.L.A.

In answer to an inquiry from the press, Bernard F. Weadock, the new managing director of the National Electric Light Association, announced on Thursday morning, April 7, that the Public Service Electric & Gas Company of Newark, N. J.; the United Gas Improvement Company of Philadelphia and the Philadelphia Electric Company had rejoined the association.

As recorded in the ELECTRICAL WORLD for August 29, 1931 (page 354), these three large Eastern utility companies resigned their membership in the N.E.L.A. soon after the adjournment of last year's convention. Their return is an auspicious beginning for Mr. Weadock's administration.

▼

Preliminary Outline of N.E.L.A. Convention

Preliminary arrangements for the National Electric Light Association's convention at Atlantic City this year call for four general sessions to be held at 10 a.m. on Tuesday, Wednesday, Thursday and Friday, June 7, 8, 9 and 10; for an Accounting Section session on Tuesday, an Engineering Section session on the same day, a Commercial Section session on Wednesday and a Public Relations Section session on Thursday, all to begin at 3 p.m. The open session of the public policy committee is set for 9 p.m. Thursday.

The manufacturers' exhibition, to be specially featured this year, will open Sunday afternoon, June 5, and remain open until the convention adjourns about 1 p.m. Friday. Other events will be the finals in the national speaking contest for employees on Monday at 2:30 p.m.—awards to be bestowed at the public relations session on Thursday—and the president's reception at 9 o'clock Monday evening.

▼

Service Charge Upheld in Massachusetts High Court

Nothing in the laws of Massachusetts prohibits a gas or an electric company from including a service charge as an element in its rate schedule, according to a finding made by the Massachusetts Supreme Court last week in appeals against the Department of Public Utilities by the city of Boston and others. The petitioners assailed the right of the

department to approve a service charge of 50 cents a month established by the Boston Consolidated Gas Company, contending that the department had no authority to approve any charge not based upon the amount of consumption. The court holds that the Legislature was clearly familiar with service charges when it gave the department authority to investigate the propriety of any proposed "rate, price or charge."

Governor Ely has signed a bill to prohibit the lending of money by gas and electric companies unless approval in writing has been obtained from the State Department of Public Utilities. The bill was based on one of the department's recommendations to the Legislature.

▼

President Murphy Answers Protesting Commissioners

A long, temperately worded letter from President John J. Murphy of the National Association of Railroad and Utilities Commissioners addressed to the five members of the California Railroad Commission, the three members of the Wisconsin Public Service Commission and to Chairman Milo R. Maltbie of the New York Public Service Commission has recently been printed. This communication was elicited by the joint letter of the commissioners just named complaining of some matters "respecting the conduct of the affairs of the association" (abstracted in the ELECTRICAL WORLD for February 6, page 252).

Mr. Murphy, pointing out that the three complaining commissions have had their full share of official and committee appointments at the national conventions, with every opportunity to make their points of view clear, declares that in his opinion their complaints are without substance and their communication uncalled for and says that he believes they "will regret the injustice which it [the letter] does to the officials of the association and to the members who attend its conventions and determine how the affairs of the association shall be conducted."

Alluding to the active part taken by Commissioner A. R. McDonald of Wisconsin in the national association's affairs, Mr. Murphy says none of the other eight signers of the letter, so far as he can ascertain, attended any convention between 1915 and last year's meeting at Richmond, with the single exception of Commissioner Whitsell of California, who attended the New Orleans convention in 1928; that Mr. Maltbie declined an invitation to be a scheduled speaker at the 1930 convention, and that prior to last year no representative of any of the three states complaining criticised, so far as he can ascertain, the conduct of association affairs. After answering the criticisms in some detail, Mr. Murphy appeals to the protesting members to participate in the proceedings of future conventions, reminding them that the association is and must be a democratic body subject to majority rule.

▼

Another Deadlock Over Muscle Shoals Indicated

Senate will probably refuse to accept provisions of House bill —Minority report in Lower Chamber.

Provisions written into the Muscle Shoals bill by the House committee conflict so much with the sentiments of the sponsors of the Senate measure that the final passage of legislation on the subject is doubtful this session, despite the expressed resolve of Speaker Garner to expedite proceedings in the House, where the matter is on the point of being taken up. Muscle Shoals appears again to be headed for inevitable conflict between the two houses.

In its report the House committee takes the position that the door should not be closed to any prospective lessee even though the time limit fixed for the negotiation of a lease may have expired. Thus, if the Muscle Shoals Commission fails to obtain a satisfactory lease within eighteen months, government operation would be authorized until such time as a lease could be obtained. Senator Norris, on the other hand, is unalterably opposed to any legislation that would make government operation conditional. He is willing to compromise on any time limit that the House may propose before government operation is undertaken, but after this period has elapsed he is opposed to any provision that would open up the matter again. Senator Norris also is opposed to any Muscle Shoals legislation that does not provide for the construction of government transmission lines in the event that a lease cannot be obtained. The House bill makes no such provision. Unless there are publicly owned transmission lines, Senator Norris does not believe that the government would be able to distribute the surplus power at rates that would be sufficiently low.

A minority of the House committee has found itself unable to support the measure that has been recommended. This minority has entered a separate report opposing any plan for government operation. It is contended that such procedure "would result in doing violence to the fundamental principles of our system of government." The dissenting members feel that the leasing provisions that have been written into the bill are so drastic that it is doubtful whether a lease could be obtained.

Drifting and Dreaming Rules the Week

BUSINESS drifts while government dreams of what could be done if things were not as they are.

No sales tax is likely, for the House has reaffirmed its opposition and voted for nuisance taxes instead. "Soak-the-rich" idea spreads and security market prices crumple to new lows in the ensuing panic.

Hoover calls for economy. Hope for balanced budget returns. Inflationists win a point in opposition to Glass bill to make banking situation better.

Automobile business shows courage and puts on heavy sales drives. Prices slashed. Battle for the low-priced-car field is on.

Car loadings drop. Energy production falls. Indexes fail to show spring revival or even normal seasonal gains.

South Georgia Utility Has Had Many Owners

In July, 1927, the Municipal Service Company, subsidiary holding company of the National Public Service Company, then controlled by Day & Zimmermann and the United Gas Improvement Company, organized the Georgia Power & Light Company to purchase the assets of the Valdosta Lighting Company, the Ware County Light & Power Company and the Waycross Ice & Storage Company, southern Georgia utilities whose stocks were owned by the Municipal Service. When the National Public Service Company acquired control of the Municipal Service in 1925 the former company belonged to the A. E. Fitkin interests. The Middle West Utilities Company did not acquire the Georgia Power & Light until 1928, when it took over the National Public Service from Day & Zimmermann.

This is the condensed, though perhaps not uncomplicated, history of the Georgia Power & Light as given by Aaron J. Hughes, Federal Trade Commission examiner, when the utility investigation was resumed on April 5. Mr. Hughes went on to explain the financial plans followed from time to time with the rapidly shifting control. In these the Seaboard Public Service Company (National Public Service subsidiary) shared. He delved still deeper into history, touching on the organization of the Valdosta Lighting Company in 1912 by bankers connected with the New England Power Company. The profits accruing from sales at increased book values at any stage were not of a sensational nature.

Examiner H. H. Carter gave testimony on interstate business between various Southern power companies.

UNDERSEA LAMPS TO SHINE ON TRAGIC WAR RELIC

Special Westinghouse lamps for undersea photography were tested at the Hotel St. George (Brooklyn) swimming pool recently for the H. H. Railey-Simon Lake expedition, which means, among other things, to explore the interior of the sunken *Lusitania*. These lamps without any covering will withstand the pressure at a depth of 200 ft. Simon Lake, inventor of the submarine, is on the extreme right.

—*Wide World Photos*

▼

New England Men Plan to Speed Electrical Farming

Educators, Farm Bureau representatives and public utility men joined with electrical manufacturers recently at Massachusetts State College, Amherst, in a three-day session on rural electrification under the auspices of the New England committee on this subject and the New England Division, N.E.L.A. About 120 were present.

Five sessions were held, in which milk cooling, water heating, electric brooding, ensilage cutting, house wiring, hotbeds and pumping were featured, together with broader discussions of the status of rural electrification, home and farm equipment needs and the more general aspects of farm and utility relations. F. L. Foss, Greenfield, Mass., presented a paper on milk cooling in which he said that eight farms producing 609,887 lb. of milk consumed 6,776 kw.-hr. for cooling in a nine-month period, or 1.1 kw.-hr. per 100 lb. cooled. N. D. Herrick, Boston Edison company, cited the results of off-peak water heating service in 24 outlying installations. Six with 30-gal. tanks paid from $1.74 to $3.99 per month and twelve with 50-gal. and 52-gal. tanks from $2.25 to $7.29 per month. The minimum energy rate is 1 cent. Paul Dempsey, Waltham field station, pointed out that electric hotbed service is yielding favorable results on the basis of about 1 kw.-hr. per day for a 3-ft. x 6-ft. sash, the operating period being about two and a half months. President W. C. Bell of the New England Division, N.E.L.A., stated that in the last three years the companies affiliated with the New England Power Association built 900 miles of rural lines, serving 4,000 new customers. He said that little objection to the service-charge principle is voiced by the actual users.

▼

Court Calls 5 per Cent an Insufficient Return

A 5 per cent return was declared not sufficient by Judge Simpson of the Connecticut Superior Court in passing upon the appeal of the Clinton Electric Light & Power Company from a rate ruling of the Public Utilities Commission (ELECTRICAL WORLD, August 22, 1931, page 311). Negotiations with the communities in informal commission hearings had failed because the company's offer of a 15 per cent reduction from a gross of about $105,000 was viewed by them as inadequate. The commission thereupon fixed the 5 per cent return on a value which the company called far too low, and the utility appealed on double grounds of confiscation. The rate had been fixed by the commission to produce a gross of $80,000, but the company's expert witnesses showed that the probable revenue would fall at least $5,000 short of this amount.

This is the first case in Connecticut of appeal from an order of the commission fixing electric rates. It disclosed a weakness of the statutes in that, while providing for appeal to the courts, the law does not prescribe whether the court shall fix a value and a rate, remand the case to the commission for rehearing, or quash all proceedings to recover the *status quo*. For that reason the court "will hear parties at a convenient time as to what judgment should be entered in the case as per suggestions made at the end of the trial." The company is prepared to offer a reduced rate, and thus the negotiations may terminate the case under the jurisdiction of the court.

▼

Safe Harbor Power Line for Pennsylvania Railroad

Application has been filed with the Maryland Public Service Commission by the Susquehanna Transmission Company for authority to construct a steel-tower transmission line beginning at a point in Cecil County, Md., on the dividing line between Maryland and Pennsylvania near Conowingo Creek and extending to Perryville, Md. The application points out that on September 2, 1931, the Consolidated Gas, Electric Light & Power Company of Baltimore, the Pennsylvania Water & Power Company and the Safe Harbor Water Power Corporation made a joint contract to supply to the Pennsylvania Railroad its entire electrical power and energy requirements on the railroad company's main line from Perryville to Washington, D. C.

The application says that the complete line will extend from the hydro-electric plant at Safe Harbor. The part in Pennsylvania will be constructed by the Pennsylvania Water & Power Company or one of its subsidiaries. The line will supply electricity to other customers if required by the Maryland Public Service Commission, but it is not proposed to permit its use to compete with any other electrical corporation.

Construction of the line, according to the application, is to be temporarily financed by funds advanced by the Pennsylvania Water & Power Company, but at a later date stock will be issued and the proceeds repaid.

▼

Ohio Legislature Passes Increased Utility Taxes

After a special session of only three days, during which it adopted four relief measures recommended by Governor White, the Ohio Legislature adjourned on April 1. Among these measures was the one previously described (April 2, page 594) which increased the excise taxes on public utilities, except transportation companies, from 1.35 to 2.35 per cent on gross earnings. The proceeds of this impost are to be applied to the retirement of county relief bonds. No strenuous debate or opposition marked the adoption of the measure.

Ottawa Sees St. Lawrence Agreement Impending

As a result of the discussions which have been taking place between the Dominion government and the Ontario government it is understood that an agreement is being drawn up involving the development of 900,000 hp. at a bus-bar cost of $15 on the Canadian side of the international section of the St. Lawrence River.

It is estimated that the cost of the Ontario development will be in the neighborhood of $115,000,000, including generators and other machinery. Of this $115,000,000, a sum ranging up to $75,000,000 will be Ontario's contribution to the cost of the joint navigation and power works that are necessary to the seaway. At a capital expenditure of $115,000,000, the capital cost of the power would work out to something between $125 and $130 per horsepower. This is considered by the Ontario government to be a very good figure. The Chippawa-Niagara development in Ontario, which is always regarded as the key work to that province's public ownership organization, has a capital cost of $138 per horsepower.

While the agreement between the province and the Dominion is said to be virtually complete, it cannot become effective until the Dominion concludes a treaty with the United States. In political circles at Ottawa it is believed there are few problems now blocking the seaway pact.

▼

Range Campaign and Merchandising N.E.L.A. Topics

Rapid integration of the National Electric Cooking Council, under the chairmanship of P. S. Arkwright, into a functioning organization complete with regional directors, local representatives and all helps and aids for the vigorous and intensive prosecution of the electric range campaign was the prophecy of the range committee at the recent meetings of the Commercial National Section, N.E.L.A., in Chicago. A report of the first day's proceedings was printed on March 26 (page 555).

An interesting point of view in regard to the apprehensions of some that the range campaign was stirring up, or would stir up, open warfare between electric and gas utility interests was offered by Albert Kahn of the Estate Stove Company, manufacturer of both electric and gas ranges. Mr. Kahn said that there was no reason for the gas industry to see the range campaign as a threat to the gas business, because the effect of electric range advertising and promotion would be to awaken the public to the possibilities of modern cooking devices, and from this awakening the gas utilities would undoubtedly benefit.

Recognition of municipal ownership as the impelling force behind the agitation against utility merchandising appeared in the meeting of the merchandising sales committee. The general power committee spent much of its allotted time in a discussion of oil-engine competition which started with the presentation of the 1931 report on Diesel-engine power costs. A West Coast committee member contributed the information that the bond issue to pay for five 7,000-hp. Diesel units for installation in the municipal plant at Vernon, Calif., was passed in an election where only 64 citizens took the trouble to go to the polls.

▼

Bostonians Rally for Better Conditions

An "all industry night" held April 1 under the auspices of the Metropolitan Electrical League of Boston attracted nearly 700 men and women from all branches of the local field, the gathering being one of a number scheduled to be held throughout the country for the purpose of stimulating co-operation. J. J. Caddigan, president of the National Electrical League Council, was toastmaster, the presiding officer being Richard Lincoln, head of the Boston league. President J. F. Owens of the National Electric Light Association was guest of honor.

Addresses by A. J. Hixon, V. C. Bruce Wetmore and T. K. Quinn voiced the co-operative aims of the contractor, wholesaler and manufacturer, while Daniel Bloomfield and A. E. Yont spoke on behalf of retailers and the furniture industry. Earl Whitehorne, McGraw-Hill Publishing Company, advocated balanced service to the home, intelligent friendship between industry branches and better orientation of trade development.

President C. L. Edgar of the Boston Edison company cited the better understanding prevailing in the local electrical trade as a result of co-operation and business fellowship taking in many kinds of stores retailing electrical appliances, the power companies, contractors, manufacturers and wholesalers. Conferences with the Boston Retail Trade Board have been especially helpful, he said. "Misunderstanding," said Mr. Edgar, "has been the main cause of division of effort in the electrical field. Now the dealer has come to know the utility as it is and not as he thought it was. The utility has come to know the dealer and to respect his position in the electrical business. Ill will has become good will." President Owens, after drawing a picture of the vast electrical market afforded by the homes of the nation, showed how service to society underlies all sound development and urged his hearers to give serious thought to the rising cost of government.

Coming Meetings

Great Lakes Division, N.E.L.A.—Engineering Section, Sherman Hotel, Chicago, April 13 and 14. R. G. Walter, Wisconsin Power & Light Co., Madison, Wis.

Northwest Electric Light and Power Association — Engineering Section, Heathman Hotel, Portland, April 13-15; H. H. Schoolfield, Pacific Power & Light Company, Portland. Accounting Section, Davenport Hotel, Spokane, Wash., April 18-19; W. F. Miller, Washington Water Power Company, Spokane.

Electrochemical Society — Lord Baltimore Hotel, Baltimore, April 21-23. C. G. Fink, Columbia University, New York.

Southwestern Division, N.E.L.A. — Arlington Hotel, Hot Springs, Ark., April 26 and 27. S. J. Ballinger, San Antonio Public Service Co., San Antonio.

American Welding Society—New York, April 27-29. M. Kelly, 29 West 39th St., New York.

Missouri Association of Public Utilities—Excelsior Springs, Mo., April 28-30. Jesse Blythe, 103 West High St., Jefferson City, Mo.

American Institute of Electrical Engineers—District meeting, Providence, May 4-7; summer convention, Cleveland, June 20-24. Acting secretary, 33 West 39th St., New York.

Middle West Division, N.E.L.A. — Muehlebach Hotel, Kansas City, Mo., May 18-20. Thorne Browne, 1527 Sharp Bldg., Lincoln, Neb.

East Central Division, N.E.L.A.—Commodore Perry Hotel, Toledo, Ohio, May 24-27. D. L. Gaskill, 603 Broadway, Greenville, Ohio.

National Electric Light Association — Atlantic City, N. J., June 6-10. A. J. Marshall, 420 Lexington Ave., New York.

Pacific Coast Electrical Association—Hotel Huntington, Pasadena, Calif. June 14-17. K. I. Dazey, 447 Sutter St., San Francisco.

Canadian Electrical Association—Manor Richelieu, Murray Bay, Que., June 15-17. B. C. Fairchild, 409 Power Bldg., Montreal.

New England Division, N.E.L.A.—Mount Washington Hotel, Bretton Woods, N. H., July 11-13. Miss O. A. Bursiel, 20 Providence St., Boston.

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Governor Laffoon Vetoes Three Utility Measures

Governor Ruby Laffoon of Kentucky has vetoed three bills, enacted by large majorities of both divisions of the Kentucky Legislature, two of which would have enabled cities of the second to sixth classes to buy, own, construct, operate or maintain utility plants, while the third provided that in cities of the third, fourth and fifth classes all utility contracts entered into by city officials must be ratified by a vote of the people.

The city of Covington is exercised over the vetoes, pointing out that the bill to permit second-class cities to own and operate utility plants passed both houses unanimously and charging that the Governor unnecessarily vetoed the measure on a technicality Some critics blame the vetoes on the so-called "power lobby." Covington is now served by the Union Light, Heat & Power Company of Cincinnati, across the Ohio River.

Utility Stocks Reach New Lows

Renewed declines in public utility stocks resulted in many new low prices. The "Electrical World" index of 50 representative stocks in this group reached 28.2, the lowest point on record. Public utility bonds also sold off heavily.

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United Public Utilities' Bonds in Default

Announcement has been made at the offices of the Middle West Utilities Company that the United Public Service Company and two of its subsidiaries—the United Public Utilities Company and the Southern United Gas Company—could not pay the April 1 interest on bonds and debentures, sufficient cash not being available. A dividend on preferred stock of the United Public Utilities Company was also unpaid.

As a result of adverse conditions the necessity of a reorganization of the United Public Service Company has now become apparent. According to the Middle West announcement the interest of all security holders and creditors can best be protected by the orderly development of an equitable plan of reorganization. The Middle West Utilities Company will co-operate in the development of the plan, work upon which will start immediately.

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Utilities Led Drop in Stock Values in March

Values of shares listed on the New York Stock Exchange reached a new low level at the end of March. In a selected list of 240 stocks compiled by the New York *Times* a depreciation of $1,925,902,983 in values occurred in March, equal to 17 per cent. Losses were sustained by all groups, with the largest amounts reported for the railroads and public utilities. Losses by the public utility stocks amounted to $608,765,874 and of this sum the electric light and power stocks were responsible for $337,013,927.

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Baltimore Utility Anticipates No Financing in 1932

In a letter to the stockholders of the Consolidated Gas, Electric Light & Power Company of Baltimore forwarded with the usual dividend checks, President Herbert A. Wagner stated that the company will have no maturing bond issue until 1935.

"It is anticipated," says Mr. Wagner, "that available cash, together with proceeds from the sale of preferred stock in small lots to customers, will make it unnecessary for your company to do any further financing for extensions and improvements during 1932."

The statement of earnings for the first two months of 1932 shows a continuance of the increase in revenue from electric sales resulting from substantially larger residential use and a temporary falling off in revenues from gas and steam sales. These latter decreases are attributable to abnormally high temperatures during January and February of 1932. The temperatures in January and February were 13.6 and 7.4 deg., respectively, above normal.

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Ontario Hydro Reports on 1931 Operations

An increase of $7,165,000 in total reserves of the various systems of the Ontario Hydro-Electric Power Commission is shown in the annual report of that body. The report points out that a total of 721 municipalities now receive hydro power, and that, despite the depression, rates have not been raised, but in some instances lowered.

The Niagara system sold power to municipalities, rural districts and the commission's individual power customers valued at $20,695,527. Actual cost to the commission for supplying this power, which cost included operating maintenance, administration, interest on the investment, etc., amounted to $20,948,114, leaving a credit balance of $647,413.

The report states that substantial progress has been made in the rural field. More than $15,507,000 is now invested in rural power districts. About 8,197 miles of transmission lines have been constructed to date, of which 1,470 were built during the last year. More than 55,000 customers are supplied in the rural power districts, and the amount of power taken by the rural customers, in the peak period of August, was 34,108 hp.

Capital expenditure up to October 31, 1931, on all properties had been $265,000,000, while total reserves of the various systems amount to approximately $62,110,000, an increase of more than $7,000,000 over the previous year.

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Delinquent Electrical Accounts

(National Electrical Credit Association)

Number of Accounts Reported

Division	February 1931	February 1932	Per Cent Inc. or Dec.	Two Months 1931	Two Months 1932	Per Cent Inc. or Dec.
New York	254	208	—18.9	502	426	—15.1
Middle and Southern Atlantic	138	87	—37.0	267	214	—19.8
New England	102	126	+23.5	184	229	+24.4
Central	647	492	—24.0	1,277	980	—23.3
Total	1,141	913	—20.2	2,230	1,849	—17.0

Total Amounts Reported

Division	February 1931	February 1932	Per Cent Inc. or Dec.	Two Months 1931	Two Months 1932	Per Cent Inc. or Dec.
New York	$42,199	$24,983	—40.8	$75,678	$45,376	—40.0
Middle and Southern Atlantic	18,771	10,806	—42.4	33,313	25,000	—24.9
New England	10,577	13,582	+28.4	15,818	20,088	+27.0
Central	61,062	44,005	—27.9	120,050	85,732	—28.6
Total	$132,609	$93,376	—29.6	$244,859	$176,196	—28.0

Smaller February Output

Electrical energy production by public utility power plants during February was 5 per cent smaller this year than last, when expressed in terms of average daily kilowatt-hours to eliminate the effect of the extra day, according to the United States Geological Survey. The actual output was 7,009,000,000 kw.-hr., against 7,160,000,000 kw.-hr.

The percentage reduction was the same as in January. Since the output in 1931 compared with 1930 was down 8 per cent in January and 6 per cent in February, the results now published indicate a present level far below that of 1930 but a smaller combined decline for the two-year interval in February than in January.

While the average daily total output

	Output Millions of Kw.-Hr.		Per Cent Change		Per Cent from Water Power	
Month	1931	1932	'31-'32	'30-'31	1931	1932
Jan.	7,947	7,559	—5	—8	30	41
Feb.	7,160	7,009	—5*	—6	30	42
March	7,876	.....	...	—4	34	..
April	7,643	.....	...	—5	41	..
May	7,639	.....	...	—5	41	..
June	7,526	.....	...	—3	38	..
July	7,766	.....	...	—2	35	..
Aug.	7,628	.....	...	—4	32	..
Sept.	7,532	.....	...	—3	29	..
Oct.	7,765	.....	...	—6	27	..
Nov.	7,406	.....	...	—4	28	..
Dec.	7,773	.....	...	—4	35	..
Year	91,661					

*Adjusted to months of equal length.

was about 1 per cent smaller than in January, the production from water power rose 3 per cent, that from fuel declined 3.5 per cent. Fuel consumption decreased correspondingly. The effect of increased stream-flow in recent months is evident from the accompanying table giving monthly production during 1931 and 1932. The statistics are for all public utility plants, not only central stations for light and power.

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Duquesne Light Earnings Off Only 3 per Cent

Gross earnings of the Duquesne Light Company for the year 1931 totaled $27,805,534, a decrease of $870,168, or 3.03 per cent, under the year 1930. This earnings record was maintained in spite of the fact that for the first time in the history of the company a decrease in customers was reported. The number at the end of the year was 309,698, a loss of 1,772, or 0.57 per cent, under 1930. The output of electricity decreased 9.70 per cent to 1,364,318,513 kw.-hr., due to reduced sales to industrial and commercial customers.

On the other hand, intensive sales efforts resulted in an increase in connected load, or business served, from 885,146 kw. to 897,638 kw., a gain of 1.41 per cent. The average use of electric service by residential customers increased from 723 kw.-hr. in 1930 to 757 kw.-hr. in 1931, a gain of 34 kw.-hr., or 4.70 per cent, reflecting the increased use of domestic electric appliances and lighting. It is interesting to note that during the year the company added more than $3,000,000 to its surplus.

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Italian Energy Production Declines 2.15 per Cent

The output of power in Italy during the past year amounted to 9,809,570,000 kw.-hr., or 2.15 per cent less than in 1930, it is stated in a Department of Commerce report based on records compiled by the Unione Nazionale Fascista Industrie Elettriche, estimated to cover about 93 per cent of the total output for the whole country. In addition, 173,323,000 kw.-hr. was imported from Switzerland, or 5.64 per cent more than in the preceding year.

Of the total production in 1931, the output by hydro-electric power amounted to 9,549,264,000 kw.-hr., 1.77 per cent less than in 1930. The production by fuel reached a total of 260,306,000 kw.-hr., or 14.22 per cent less than for 1930.

Illinois Power Sells $4,072,000 Common Stock Interest

The Illinois Power & Light Company, controlled by the North American Light & Power Company, has sold its common stock interest in the Kansas Power & Light Company to the North American company. The common stock, carried at $4,000,000 par value, was sold for $4,072,000 par value of 6 per cent cumulative preferred stock of Kansas Power acquired from the latter by North American Light at par.

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Kansas City Utility Floats New Bond Issue

Offering of an additional issue of first mortgage gold bonds was made by the Kansas City Power & Light Company at 92⅜ and interest, to yield 5 per cent, a piece of financing involving a total of $5,250,000. These securities, dated February 1, 1931, will mature February 1, 1961. In connection with this offering the company has announced that it has contracted to acquire the properties of the People's Gas & Electric Company of Mason City, Iowa.

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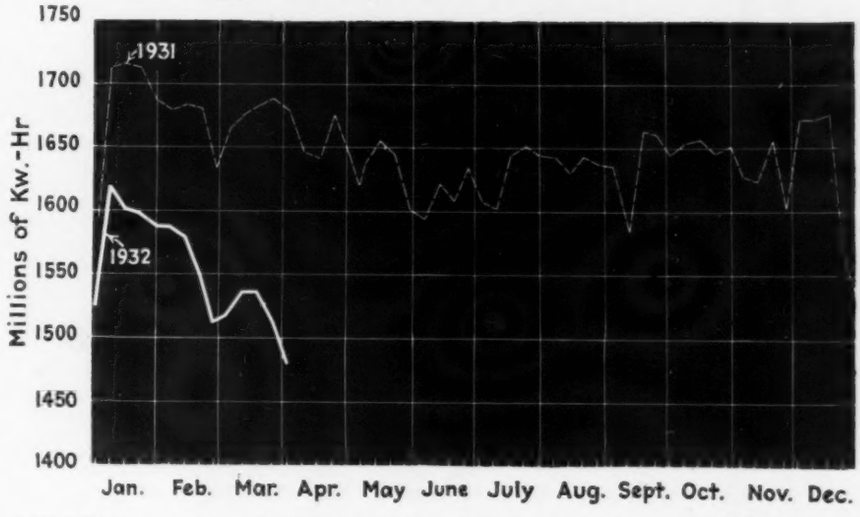
Energy Output Slumps Heavily



ENERGY output of electric light and power companies in the week ended April 2 is estimated at 1,480,208,000 kw.-hr., a decrease of 11.9 per cent compared with the corresponding week of 1931, according to the National Electric Light Association. A portion, at least, of the decline is attributed to the smaller demand for power for irrigation in the Pacific Coast states, where the difference between this year's output and last year's has for several weeks been large. Another portion seems to be accounted for by the somewhat larger March output last year than was normal, in comparison with other months.

Operations in the Eastern states continue most nearly on the 1931 level. In the central industrial region there was a further decline.

Weekly Output, Millions of Kw.-Hr.

	1932	1931	1930	1929
April 2	1,480	1,680	1,708	1,663
March 26	1,515	1,689	1,723	1,680
March 19	1,538	1,682	1,722	1,683
March 12	1,538	1,676	1,736	1,687
March 5	1,520	1,664	1,750	1,703

Per Cent Change from 1931

Region	Week Ended April 2	March 26	March 19
Atlantic seaboard	— 6.6	— 4.7	— 3.2
New England alone	— 6.6	— 4.3	— 4.6
Central industrial	—15.7	—13.9	—12.4
Chicago district	—12.6	— 9.8	— 8.9
Pacific coast	—15.2	—16.6	—14.2
United States	—11.9	—10.3	— 8.6

Coffin Awards for 22 General Electric Men

Constructive ideas have won recognition for 22 employees of the General Electric Company. Awards under the Charles A. Coffin Foundation, established by the company in 1922 as a tribute to its first president, have been presented to twelve factory employees, eight engineers and two salesmen.

Four of the winning suggestions had to do with the manufacture of electric refrigerators and four others were concerned with electric welding in its various applications in General Electric plants. Three engineers at the Pittsfield, Mass., Works of the company were cited jointly for the development of "Thyrite."

The awards are as follows: Factory employees—Earl J. Stewart, John Guare, Edward J. Burke, Henry J. May and Albert Alexay of Schenectady, Erwin C. Schlipf and Emil J. Bartz of Erie, Pa.; Adolph J. Rose of Fort Wayne, Ind.; Edward Aurada of Cleveland; Oscar E. Frederick of Philadelphia; Gordon F. Kelley of Lynn, Mass., and Jacob J. Vienneau of Pittsfield, Mass.

Engineers—Karl B. McEachron, L. H. Whitney, J. R. T. Craine and Frank M. Clark of Pittsfield, Mass.; Marion A. Savage and C. A. Nickle of Schenectady; E. H. Horskotte of Erie, Pa., and William A. Lewin of Chicago.

Salesmen — David P. Burleigh of New York and Francis E. Fairman of Pittsburgh.

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Westinghouse Cuts Common Quarterly to 25 Cents

Westinghouse Electric & Manufacturing Company has declared a dividend of 25 cents on the common stock and the regular quarterly dividend of 87½ cents on the preferred stock, both payable April 30 to stock of record of April 11. A dividend of 62½ cents on common was paid January 30, 1932.

New Power Equipment for Panama Canal

Engineers of the General Electric Company, which equipped the locks of the Panama Canal nearly 20 years ago, will participate in the new Panama construction undertaking, the building of a four-million-dollar dam across the Chagres River. Electric motors of 100 hp. are to move two tall cableway towers on each bank of the river, and a motor of 400 hp. will propel a 20-ton bucket for excavating and concrete work. More than 22,000,000,000 cu.ft. will be inclosed by the reservoir which will be formed by the dam and will control the volume of water supplied to the canal locks by the river. The dam will also be the site of a hydro-electric power plant to contain two General Electric 10,000-kw. generators. Transmission lines at 44,000 volts will connect it to the canal electrical system and the Gatun power station, which General Electric equipped when canal was built.

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Exports of Electrical Equipment (Preliminary)

Article	January 1931	January 1932
Generators:		
Direct current—		
Under 500 kw	$23,731	$8,508
500 kw. and over	15,730	.....
Alternating current—		
Under 2,000 kva	8,008	1,493
2,000 kva	15,240	32,987
Steam turbine-generator sets	78,804	39,183
Accessories and parts for generators	38,713	95,859
Arc-welding sets	54,320	12,893
Self-contained lighting outfits	19,984	6,941
Batteries:		
6-and 12-volt storage batteries	131,274	67,630
Other storage batteries	148,524	13,747
No. 6 dry-cell batteries	37,957	15,294
Flashlight batteries	200,979	152,774
Radio B and C batteries (dry)	31,748	11,690
Other dry and wet cell primary batteries	9,768	3,854
Transforming or converting apparatus:		
Power transformers over 500 kilovolt amperes	45,397	16,477
Distribution transformers, 500 kilovolt amperes and less	66,613	17,439
Instrument transformers	14,588	8,283
Other transformers	30,670	27,609
Complete battery chargers, non-rotating	6,403	4,316
Double-current and motor generators, dynamotors, synchronous, and other converters	93,589	43,693
Transmission and distribution apparatus:		
Switchboard panels, except telephone	300,581	23,139
Power switches and circuit breakers, over 10 amperes	140,077	25,793
Fuses	20,460	7,839
Watt-hour and other measuring meters	32,057	7,653
Electrical indicating instruments	52,594	26,688
Electrical recording instruments	17,749	24,081
Other electrical testing apparatus	72,976	48,240
Lightning arresters, choke coils, reactors, and parts	33,966	62,239
Motors, starters and controllers:		
Motors, ¼ hp. and under	119,582	49,781
Motors, over ¼ and under 1 hp	27,266	13,224
Stationary motors—		
1 to 200 hp	$174,949	$40,921
Over 200 hp	40,842	7,700
Railway motors	22,377	1,400
Electric locomotives—		
Railway	39,124	.....
Mining and industrial	12,273	8,736
Station and warehouse electric motor trucks	2,300	3,236
Starting and controlling equipment—		
For industrial motors	90,834	116,346
For electric railway and vehicle motors	6,781	2,089
Portable electric tools	53,887	25,106
Accessories and parts for motors	152,487	90,693
Electric refrigerators and parts:		
Household	323,437	205,991
Commercial up to 1 ton	113,911	74,793
Parts for electric refrigerators	184,654	148,496
Electric appliances:		
Flash-light cases	54,556	19,377
Electric fans	28 496	11,582
Electromechanical health exercisers	6,621	140
Electric incandescent light bulbs—		
For automobiles, flashlights, and Christmas trees	13,608	15,028
Other metal-filament bulbs	76,145	25,966
Other electric lamp bulbs	16,473	6,553
Searchlights and floodlights	63,548	.....
Searchlights and airport beacons	.....	115
Floodlights	.....	2,228
Electric household washing machines	71,103	36,480
Electric domestic vacuum cleaners	80,503	21,445
Other domestic motor-driven devices, except tools	25,750	26,129
Electric flatirons	5,183	1,906
Electric cooking ranges	21,418	7,696
Other domestic heating and cooking devices	71,713	15,531
Industrial electric furnaces, ovens, and other heating devices	83 769	20,687
Therapeutic and x-ray apparatus	124,120	56,260
Signal and communication devices:		
Radio apparatus—		
Transmitting sets, tubes and parts	47,662	47,814
Receiving sets	$1,075,814	$685,830
Radio receiving tubes	131,552	132,437
Receiving-set components	250,980	236,970
Loudspeakers	104,784	46,317
Other receiving-set accessories	61,112	33,144
Telegraph apparatus	17,313	19,379
Telephone apparatus—		
Telephone instruments	17,641	13,800
Telephone switchboards	9 482	2,653
Other telephone equipment	229,277	85,054
Bells, buzzers, annunciators and alarms	26,004	33,863
Other electric apparatus:		
Starting, lighting, and ignition equipment	91,234	31,215
Insulating material	58,960	27,277
Metal conduits, outlet, and switch boxes	58,676	28,078
Sockets, outlets, fuse blocks, and lighting switches	128,144	73,468
Electric interior lighting fixtures	105,860	42,199
Electric exterior lighting fixtures	42,597	18,931
Other wiring supplies and line material	111,385	35,405
Other electrical apparatus, n.e.s.	444,463	185,231
Rubber and friction tape	31,763	18,155
Globes and shades for lighting fixtures	45,219	16,055
Glass electric insulators	10,764	6,049
Electrical porcelain:		
For less than 6,600 volts	26,246	8,330
For 6,600 volts and over	22,744	19,193
Carbons and electrodes:		
Electrodes for electric furnaces	174,981	114,412
Other carbon products	55,643	.....
Carbon brushes and stock	.....	6,265
Other carbon products	.....	43,898
Insulated iron or steel wire and cable	21,997	5,978
Copper bare wire	129,602	48,743
Insulated copper wire and cable:		
Rubber-covered wire	61,955	46,044
Weatherproof wire	21,862	24,304
Telephone cable	25,832	12,304
Other insulated copper wire	214,830	73,104
Nickel-chrome electric resistance wire	15,458	19,659
Electric clocks	.....	5,458
Totals	$7,722,046	$4,108,993
Six months ending Dec. 31	$58,955,102	$41,654,223

Utility Companies Help Stabilize Retail Sales

"Vacuum cleaners selling at high retail prices through house-to-house canvassers have suffered a shrinkage believed to be about 75 per cent of the 1929 volume, while popular-priced machines sold largely through power companies and their co-operative dealers without high commissions have suffered virtually no shrinkage during the depression years," declared Taylor P. Calhoun, treasurer of the Sweeper-Vac Company, Worcester, at a recent legislative hearing in Boston.

Referring to his company, the speaker said that its ability to employ about 150 people regularly and maintain a high percentage of working hours during the past two years has been largely the result of a similar degree of stability in the retail distribution of the company's products through the light and power companies of the state. He continued:

It is our firm conviction that independent local merchants, when properly supported by the power company, can render service on electrical household appliances superior to that of the mail order houses and chain stores. The chain stores endeavor to sell at a little lower price than the independent local merchant, making up the difference by the elimination of servicing. In the case of most appliances adequate instruction, demonstration and servicing add a great many dollars to the usefulness of such devices.

We know of hundreds of cases where, owing to changes in dealerships, death of dealers, transfer of ownership and other reasons that put the dealer out of business, the power companies have rendered, both without charge and at a fair charge, the same service that the purchaser expected to receive from the dealer had he remained in business. This has been of the greatest value to us as manufacturers during the last two years of excessive business failures, but it has been of even greater value to the consumers, who would have been seriously affected had this service been unavailable. Any legislation restricting the lighting companies will automatically restrict the manufacturers in the same proportion.

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Low-Voltage Overhead Networks May Revolutionize Distribution

NO LONGER need the advantages of the network principle of energy distribution and the quite as important economies of mass production of network units be confined to underground practices. Announcement has just been made by the Westinghouse Electric & Manufacturing Company that low-voltage overhead network protector units are in production at East Pittsburgh. Rumors of such a development have been current for some time and unfilled orders from utility organizations for this type of equipment indicate that if plans carry through a significant change in distribution practices and a new market in distribution equipment would appear to be opening.

Engineers estimate that loads as low as 1,500 kva. per square mile can be economically justified for change-over to low-voltage overhead network operation. Approximately 2,200 kva. per square mile is an optimum figure. It is thought that purely residential areas offer the most likely opportunities for introduction and experimentation at the present time.

Owing to the lack of an economically priced, light-duty, low-voltage network, protector growth of the low-voltage network system has been limited to commercial areas in cities where high load densities have justified the expense associated with underground systems and where continuity of service and system flexibility could be capitalized highly.

The problem to be solved before low-voltage overhead networks could be feasible was that of a weatherproof protector for residential areas having roughly one-sixth the weight, one-quarter the size, and one-third the price of the smallest and lowest-priced submersible underground protector made, but capable of performing exactly similar functions of network control.

The solution of this problem as found by Westinghouse lay in the application of the Deïon principle of arc extinction to air circuit breakers of low capacities. Since the Deïon chamber suppresses the arc internally, the usual space provided above the contacts in conventional breakers for dissipation of the disturbance is eliminated, and the adjacent poles of the breaker can be mounted as closely together as is mechanically possible. In the CM-4 protector the AB Deïon breaker may be either manually or electrically operated.

Studies are in progress to analyze the economics of applying the unit in connection with buried cable with the transformer and protector installed below the sidewalk in precast concrete vaults or mounted in the basement of apartment houses. For the latter installation the weatherproof housing will be omitted and the protector elements mounted on a simple slate base at lower cost.

Beginning in May the Westinghouse company will actively promote the sale of this equipment.

Major New Construction This Week

SUBSTATION, motors and control, conveyors and other electrical equipment to cost over $30,000 proposed for manganese ore refining mill of General Manganese Corporation, Detroit, Mich., at Sioux Falls, S. D.

Electric machinery and auxiliary equipment to cost $35,000 needed for new creamery to be established at Dardanelle, Ark., by the Blue Valley Creamery Company, Chicago, Ill.

Electrically operated machinery costing $40,000 for a complete 50-ton capacity ice-manufacturing plant will be purchased by K. A. Murray, Sioux City, Iowa.

Motor-driven pumping machinery and auxiliary equipment for a series of individual pumping plants will be installed by Independent Pipe Line Company, subsidiary of Phillips Petroleum Company, Bartlesville, Okla., for proposed 45-mile pipe line. Initial capacity of 6,000 bbl. per day. A $100,000 project.

San Diego, Calif., calls for bids for machinery for Diesel power plant, with auxiliaries for ornamental street-lighting system.

Waterwheel, generator and accessories, with poles, wire and cable, and fittings for transmission and distributing lines, will be purchased by C. J. Call, Pocatello, Idaho, for a hydro-electric generating plant in Star Valley district, Wyo.

Sumner, Iowa, has voted bonds for $95,000 for a city-owned electric light and power plant. Bids for engine-generator unit, boilers, pumps, switchboard and accessory equipment will be asked late in May.

Refrigeration Sales Up

Large sales increases were recorded by the electric refrigeration industry during the first month of this year, according to Chairman J. E. Davidson of the electric refrigeration bureau of the National Electric Light Association. "January domestic sales of manufacturers which are members of the National Electrical Manufacturers' Association exceeded the corresponding month of 1930 by 3.4 per cent, and were 55.2 per cent greater than in January, 1931," Mr. Davidson explained. Estimated totals for all manufacturers show increases of 6.7 per cent and 55.9 per cent over 1930 and 1931, respectively.

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New York Metal Prices

	March 30, 1932 Cents per Pound	April 6, 1932 Cents per Pound
Copper, electrolytic	6	5.75-5.85
Lead, Am. S. & R. price	3.00	3.00
Antimony	6.125	6.00
Nickel, ingot	35.00	35.00
Zinc, spots	3.15	3.15
Tin, Straits	21.20	19.15
Aluminum, 99 per cent.	23.30	23.30

Indirect Service Upheld in Illinois

A complaint of the Vermilion Utilities Company against the Illinois Power & Light Corporation has been dismissed by the Illinois Commerce Commission. The complainant, which serves rural territory in Vermilion County, now obtains its energy from two companies which in turn get the power from the Illinois Power & Light. The Vermilion company asserted that it could buy the power cheaper directly from the Illinois Power & Light, which refused so to serve it. The commission held that the proposed change would not improve service and that there was no evidence to show that the rate now paid is unreasonable.

▼

Rate Experts' Fees in Georgia

A municipal government cannot pay a rate expert for his services out of tax moneys, according to a ruling just handed down by the Georgia Supreme Court. Last year the city of Atlanta employed Dr. John Bauer as rate expert. Councilman Stewart obtained a permanent injunction on the ground just stated, and this has now been sustained. The decision will affect other cases in Georgia, notably a suit on the part of Dr. Bauer to secure payment of $10,000 for services rendered to the city of Augusta.

▼

Watertown, N. Y., Renews Contract

A new five-year contract under which Watertown, N. Y., will continue to sell its surplus municipal-plant power to the Northern New York Utilities contains clauses providing that the contract may be terminated if the city shall enter upon general lighting because of construction of a projected Panther Mountain reservoir for the St. Lawrence power development, or if the Panther Mountain reservoir is built and an agreement cannot be reached on a better schedule of rates. In the past five years the sale of surplus power from the municipal plant has brought the city more than a half a million dollars.

▼

Fishways Compulsory in Oregon

Oregon's Attorney-General holds, in a written opinion, that the State Game Commission is vested with the authority to "compel the construction of durable and efficient devices to permit of the migration of fish in Oregon streams." Upon being so advised the commission ordered its engineer to prepare immediately plans and specifications for adequate fishways past all obstructions in the Sandy River, this being the initial development to be undertaken by the department under the jurisdiction just announced. Estimates by the commission engineer place the cost of rendering Oregon streams safe for fish migration at approximately $250,000. This expenditure will be borne largely by the operators of hydro-electric utilities.

▼

ENERGIZED CABLES LOWER HAZARDS OF FOG

Wide World Photos

Army Air Corps experiments are under way at Dayton, Ohio, to mitigate hazards from fog by use of energized cables laid in concentric circles beneath the surface. Code signals will inform the pilot just where he is. The picture shows a working model in operation with vertical loop (marked by flag) directed toward center.

▼

Central Maine Buys Three Plants

President W. S. Wyman of the Central Maine Power Company has just announced purchase from the Northeastern Public Service Company of three small Maine utilities—the Livermore Falls Power & Light Company, serving Livermore Falls, Jay and other communities; the Turner Light & Power Company, serving Turner and Livermore, and the Dennistown Power Company, which serves Jackman.

▼

Rate Inquiry for Tennessee Utility

An order requiring the Kentucky-Tennessee Light & Power Company, serving more than a dozen west Tennessee cities, to show why its rates should not be reduced has been issued by the Railroad and Public Utilities Commission of Tennessee. It is predicated on complaints from various communities following a mass meeting in Dresden. There will be a hearing on April 19.

Henry May Extend Hydro Inquiry

Before the recent adjournment of the Ontario Legislature Premier Henry declared that if the one-man commission now investigating certain Hydro contracts advises him that the evidence shows there should be a wider inquiry, he will provide promptly for one. A member of the House alleged that in recent years the Hydro has purchased power "far in advance of its needs," instancing the purchase of the Foshay development on the Saugeen River as one example. Since that purchase, the Hydro commission, this member alleged, has closed the plant down and scrapped expensive equipment.

▼

Gifts Not Chargeable to Expense

In ordering the New York Telephone Company to eliminate from its operating expense account all donations and to charge these against surplus earnings Chairman Maltbie of the New York Public Service Commission said: "Even if the expenditures did help to shorten the depression, there is not a word of testimony to indicate that by so doing any subscriber has been or would be benefited." The telephone company disputed the commission's jurisdiction, claiming that the Interstate Commerce Commission controlled matters of accounting affecting interstate corporations.

▼

One Barking Creek Tower Finished

The highest tower in the United Kingdom has just been completed at Barking Creek, London. It is 362 ft. high and connects the power station at Barking with the main grid cable system in the eastern part of the inner London electricity area, carrying four 66,000-volt lines over the River Roding. This transmission tower was referred to in the ELECTRICAL WORLD for December 12, 1931 (page 1029) in connection with a paragraph on two still taller towers required for the River Thames crossing.

▼

Baltimore Power 82 per Cent Hydro

Owing to the operation of the initial installation of the Safe Harbor Water Power Corporation, it is reported that the proportion of hydro-electric energy sold by the Consolidated Gas, Electric Light & Power Company of Baltimore in January and February rose to 82 per cent against 18 per cent furnished by steam plants in that city.

▼

Electric Men to Help Retailers

Announcement that the Electrical Association of Philadelphia will establish a retail merchandising bureau

and adopt a policy of active co-operation with retail electrical dealers in the Philadelphia territory is made by George R. Conover, managing director. Mr. Conover stressed the necessity for greater co-operation in all branches of the industry if merchandise sales quotas set for this year are to be met successfully.

Explaining the functions of the bureau and outlining details of the plan, Sherman W. Griselle, of the dealer division of the association, pointed out that results this year depend on properly building up retail sales outlets to enable them to absorb manufactured stocks and move them to the consumer. This can only be accomplished, he declared, by assistance and co-operation from every unit in the industry. The dealers' plan developed by the association, Mr. Griselle asserted, comprehends every assistance in improving selling methods, supervision and help in stock control, accounting and various other phases of retailing which many dealers of one sort or another are not equipped to do for themselves.

▼

System Field Tests Cover 260 Service Years

With the aid of the operating staff of the Indianapolis Power & Light Company a score of Westinghouse engineers have secured a mass of data and hundreds of oscillograms during a two months' test on one of the country's most modern 138-kv. power systems. Almost every conceivable type of fault was placed on the Indianapolis company's system to check the theories behind the application of relays, circuit breakers, supervisory dispatching, etc. This is said to be the first loop system designed for high-speed operation. Utility engineers are reported as well pleased with the way the system behaved. Tests are considered to cover the equivalent of 260 years of normal operating service.

More than 400 faults, both "arcing" and "solid," were thrown on the system, many involving the entire capacity of three great power companies in Indiana and Ohio. After thirteen of the heaviest possible short circuits the oil in the 138-kv. Deion grid circuit breaker tested the same as before the test. Another breaker was called upon to interrupt 62 short circuits, some of which were over a 1,000,000-kva., three-phase equipment in the arc. The oil was practically the same as to dielectric strength after the test as it was before and the contact burning was so minor that the breaker could go back into service with but minor dressing. A battery of oscillographs recorded complete test data, including the characteristics of energizing and de-energizing the line and the rate of "voltage recovery" of the system, which were recorded by a portable cathode-ray oscillograph.

Designed as a single unit by the Management & Engineering Corporation of Chicago, the new Indianapolis 87,500-kva. generating station, with its 46-mile loop (only in operation since November, 1931), has co-ordinated high-speed protection. Studies of the results obtained in the tests are now under way at East Pittsburgh.

▼

Studded Tubes Reduce Furnace Depreciation

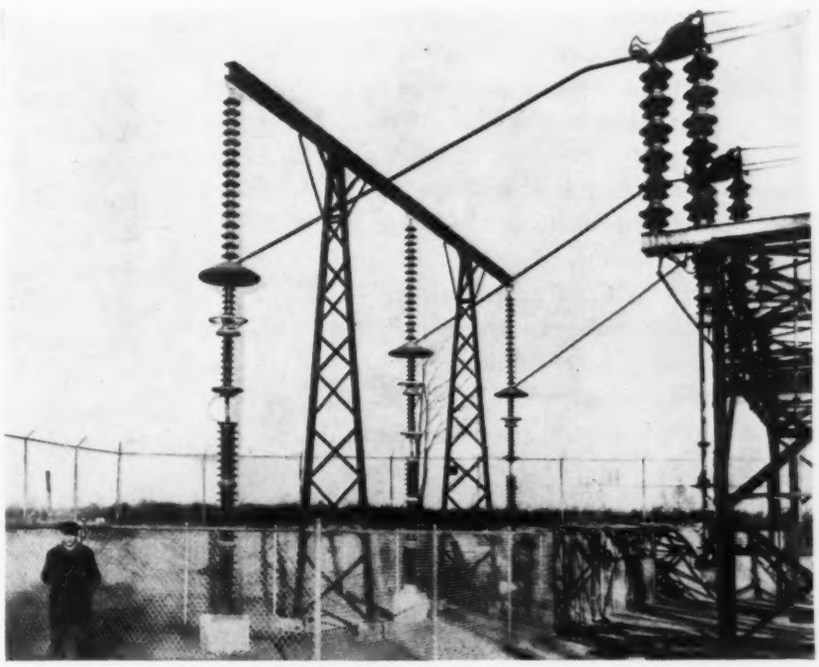
A new form of furnace-wall construction designated as the stud-tube type has been installed and is operating successfully in one of the furnaces at the State Line generating station of the Chicago District Electric Generating Corporation following successful experiments in that station with a dust- or slag-collecting screen of the same type.

This innovation involves studs or pins from 1⅛ to 1½ in. long and about ½ in. in diameter, welded to give a sort of porcupine effect on the 180 deg. of tube surface that is exposed to the fire. The interstices between the studs are filled with a plastic refractory to a little more than the height of the pins. The basic idea is that the furnace slag will accumulate on the surface thus prepared and will automatically either be retained or renew itself according to conditions of furnace operation. With the low-grade Illinois coals used the refractory and ash coating is quickly reduced to an equilibrium point so that erosion is checked. It is believed that this design is suitable for still higher ratings and if necessary the utilization of even lower grades of fuel than those used up to this time.

The new stud tubes, with their lower investment cost, appear to hold interesting possibilities, especially for pulverized-coal-fired furnaces. They offer the possibility of use to make up a new type of wall structure with the same fundamental characteristics as the familiar block-covered wall, but in a different form to supplement present constructions. Thus a combination of the two types might be used to meet a wide range of conditions.

▼

230-Kv. Lightning Arrester Tested with 15,000 Amp.



Supposedly for the first time, full-sized 230-kv. lightning arresters were tested recently with surge energy comparable to that found in service. The porous-block arrester shown here withstood the entire output of Westinghouse's 3,000,000-volt, 36,000-watt-second lightning generator, passing 15,000 amp. to 20,000 amp. with a wave front three times as steep as any recorded in the field. The arrester was unharmed. In this test the 230-kv. autovalve arrester was paralleled by a 64-in. spillway gap, as recommended for circuits of 230 kv., and a string of fourteen suspension insulators. Surges of increasing strength and steepness of wave front were then applied. In every case the arrester prevented flashover of the spillway gap. Results of the full-size test substantiate values predicted by laboratory tests on smaller units of decreased cross-section.

EDITORIALS

L.W.W.MORROW
Editor

Co-operating to help farmers

BETTER living and working conditions for the farmer are sure to result from such a co-operative meeting as a recent rural electrification institute at Amherst, Mass., when various groups serving the agricultural industry through governmental, educational, manufacturing and utility channels exchanged views on current problems of equipment application, home-service work, line-extension economics and inter-industry relations. Better understanding between utility people and those who are devoting their lives through carefully planned instruction to helping farmers to work more profitably and to live more comfortably is inevitable when these groups meet under such auspices.

In the past many utilities have failed to realize the value of approaching the farmer's problems through the county agent and home-service demonstrator of the Farm Bureau, but this condition is rapidly changing for the better. Just as the industrial power engineer of the utility occupies a key position in relation to industry contacts, so the county agents and their staffs possess intimate knowledge of local farm personnel and conditions which should not be overlooked by power companies desirous of maintaining the best possible relations with the scattered agricultural customers and prospective customers of their territories. The farmers have confidence in the county agents and their associates, and these in turn, if the chance be given them, quickly learn to appreciate the objectives and policies of progressive power companies. Anything which makes for better understanding between these agencies contributing to the betterment of farm life cannot help but benefit the farmer in the long run and so collaterally build patronage and good will for the purveyors of electricity and the products of electrical manufacturing.

Make April tell

MOST observers believe that April will indicate the business outlook for this year. This opinion is based upon the fact that the Washington remedies have reclaimed the banks and established a flexible credit mechanism, upon the further fact that the automotive industries are embarked upon the most intensive merchandising drive of their history, upon the psychological effect of the weather and the season, and upon the time required to turn credit into purchasing power.

Conditions in the electrical industry parallel the national situation. At present energy sales are decreasing, manufacturing sales are stationary, credit for financing is a little better, and sales campaigns of great importance are under way in the domestic market. Maximum economies in the industry have been put into effect and bare-boned organizations are going after business bare-handed. No one can predict the future, but it is the part of wisdom at this time for all to co-operate in an endeavor to get business. Current plans for aggressive action should be put into operation effectively and confidently. The range, refrigerator, water-heater, lighting and other campaigns in the domestic field should be pushed. The power sales departments should go after industrial loads now that industries must make money. And both utilities and manufacturers should spend for new plant and equipment at least to the extent that new money brings a fair return. This is the time for a sane endeavor to utilize favorable underlying conditions to overcome the depression inertia.

Integrity first qualification of technical adviser

NO ADVICE is better than the integrity of the person giving it. So said an industrial consulting engineer talking before a group in New York recently. He referred to the problem which an industrial-plant management encounters in seeking advice on when to generate power and when to purchase it. There is always the danger, when the management relies on one of its operating staff, that the adviser may advocate generation because it will either help him retain his job or make a bigger job for him. If an outside consultant is employed, with a fee based on money to be spent rather than on a retainer, he may be tempted to recommend generation by the plant concerned when it is not justified. The same may be true if the consultant accepts a commission from suppliers of equipment. While utilities have the incentive to increase the use of their power, this industrial consultant declared that he had never found them anything but square. They cannot afford to be otherwise because they have to live with their customers, and any misrepresentation will be quickly detected, with the permanent loss of business.

This consultant's comments were not intended to indict any one class of adviser, but rather to emphasize the necessity of inquiring most carefully into the integrity and character of the consultant. The technical and economic ability of an adviser to analyze the problem is a consideration that comes second. The first is his integrity.

Advantage in basing rates on broad economic areas

BY DECISION of a United States district court the city is decreed to be the utility rate-making unit for the State of Indiana. That is to say, in Indiana no utility serving cities, towns, villages and farms may prorate costs over its entire system and erect thereon a uniform rate schedule applying to all customers. Yet there is a tremendous body of well-informed opinion that recognizes the added cost of service to farms and outlying communities and that says it is right and just in the interest of the whole nation that the cost of electricity in rural areas should not be made prohibitive by allocating all benefits of volume distribution to the cities. Local advantage, according to this rational attitude, must be subordinated somewhat to the national good. On the other hand, it is quite possible that insistence on full local benefit from the lower costs of service in particular local cases may actually add so much to utility administration and operation costs as to prevent or defer rate reductions otherwise possible.

Electric utility operation is more than just a local affair. There are two reasons why it cannot be only that. The first is that up to more or less easily recognizable limits there is a realizable economy in investment and operation of the extended system. The second is that electric service cannot be confined strictly to those areas where it is easily a profitable operation, but it should spread out—in fact, there is a demand that it be spread out—over territories where profits are slim at best and often are zero or less. Therefore, if both economy and social pressure require the electric utility to be treated as a large-area service unit, it is reasonable to expect that rates should be erected on that basis.

Maintenance for balance sheets

IN TIMES of economic stringency all values contract to the norms established by the ultimate referees of credit, the bankers. Equities shrink in the face of a drive for attainment of liquidity and an attractive balance sheet. Physical and commercial security for the future are subordinated to the demand for a respectable annual report. Current maintenance is thus likely to be sacrificed to preservation of a high ratio of quick assets to quick liabilities. Retirement and depreciation reserves are built up for the sake of curtailing an operating outlay so that it will be commensurate with shrunken gross receipts.

Who derives the most benefit from this tendency—the banker who has a loan at stake or the stockholder who has an investment and an equity in future earning prospects? Who suffers most if deferred maintenance means new capital and a delay in resuming production when the "Let's go" order is timely? That money for maintenance is not to be derived from profits in these days; it is salvaged from operation and converted to a fic-

titious capital item. That maintenance money is not spent; it is withdrawn from the real equities so that corresponding withdrawals from the depreciation reserve can be converted to quick assets.

The interest of the inarticulate stockholder is in the future, in the ability to resume prompt and efficient production when the market demand revives. Deferred maintenance is distinctly detrimental to the interests of the stockholder, and he will do well to impress upon management a need for most judicious transfer of items from operating to capital account in meeting the more articulate desires of the credit dictators. Even the Bible shows more concern about the depredations of rust and moths than it does about preparing a vault for the repose of an artificial ultimate.

Managements should look to their maintenance if they have half as much hope for the future as they have fear of a receivership. Divert some of the depreciation reserve increments from establishing liquidity in assets to preserving fluidity of the productive capacity of the tools of the business. Otherwise a high price may be found to have been paid for a rosy-looking ratio of corporate liquidity.

The four major problems of the range campaign

SUCCESS of the refrigeration campaign has inspired the manufacturers of electric ranges and the power companies to organize another great industry drive to sell electric cooking to the American home. The bogey is another million in three years. It can be done. It will be much more difficult, however, than selling refrigeration, and success will rest upon the courageous preparation of the industry itself to do the job.

Four points stand out as the chief obstacles to the sale of the electric range today:

ONE—*The prejudice of electrical men against the range.* When the refrigeration campaign started every electrical man was a booster. But not so with the range. Many combination companies oppose it. Most power-company men don't use them and, along with contractors, dealers, wholesalers and manufacturers of other electrical equipment, express doubt. They question cost of range, cost of installation, cost of use. They must be brought to confidence in the product as well as the program. Here lies the most difficult sales problem of the campaign, for the public won't buy ranges while electrical men are skeptical.

TWO—*The need for the instruction of the woman who buys a range.* It is harder to sell an ironing machine than a clothes washer, because results depend upon the proficiency of the operator. Anybody can keep food in a new electric refrigerator, but to use the new electric range means changing old habits and learning new methods. It is harder to sell, for it requires demonstration, instruction, follow-up. Power-company home-service staffs must therefore be built up behind the local range campaign to see that ranges sold give satisfaction and help sell other ranges in the neighborhood.

THREE—*The cost of wiring to the new range.* To sell first the range and then a separate wiring job makes two costly things to buy and blocks many sales. One price should be quoted that covers the range installed. Whether or not the power company pays for the wiring, as a profitable extension of its line to the load, with the contractors doing the work at an agreed average price, must be settled locally. More and more companies are adopting this method. But the wiring must be figured in the price, and an orderly system of handling installations must be arranged.

FOUR—*The lack of adequate profit spread for the dealers.* The refrigeration campaign has succeeded because both distributor and dealer have been able to make money and have sold 85 per cent of them. But for twenty years power companies have controlled the distribution of ranges and sold 95 per cent of them. There has been no place for the distributor and dealer in the price structure. Nor will they sell them extensively in this campaign unless there is an adequate discount to permit the dealer to hire salesmen. Power companies must purchase through distributors to give them volume. Without an adequate compensation the refrigerator type of distribution cannot be set up and the million ranges won't be sold.

The greatest danger to the range campaign lies in the risk that electrical men will say: "Sure! Let's sell electric ranges next. Bring on the program. It's easy!" and think that they can sell them as they sold refrigerators. It won't be easy. But it can be done—if the industry prepares to do this different kind of a job.

With a four-cent rate or better available to eighteen million homes and seventeen million of them now without ranges, electric cooking can be easily sold to a million households in three years—provided that manufacturers, wholesalers, dealers, contractors and power companies will frankly face these facts and adjust their mental attitude and policies to meet these conditions. Then the plan book and the national advertising and the local programs and the selling and the demonstration and the installment financing will work.

Valuations Guide Commission Regulation

By HENRY B. SHAW*

Chairman Vermont Public Service Commission

YEARS ago the Vermont Legislature conferred jurisdiction upon the Public Service Commission to approve securities issued by utility corporations "in order to prevent overcapitalization" and to make rates just and reasonable. Each of these subjects, capitalization and rates, is based on the fair and honest valuation of the property and, as a corollary to such valuation, on proper and well-recognized accounting practices. If the total amount of securities outstanding is within the fair value of the property there can be no overcapitalization, and if the rates yield a fair return on the fair value of the property they are just and reasonable. Therefore, fair value is the very foundation of any efficient system of utility regulation.

Prior to the enactment of the expert law of 1925, the comission had no selection of the witnesses on valuation, and it was therefore compelled to take the testimony of the company's own officials or experts selected by the company on this most important subject. With the best intention on the part of the commission, this resulted in inflated values. The commissioners, having no technical knowledge of the cost of electric plant and having no means of checking values offered by the companies, were naturally enough misled as to the facts, for it must be remembered that the higher the value found by the commission the more securities were issued and increased rates resulted.

One has only to call attention to the failure and receiverships of the Hortonia Power Company, the Clyde River Power Company and the Eastern Vermont Public Utilities Corporation to show the direct consequence of this inflation of capital.

As a cure for this intolerable situation and to aid the commission in its determination of sound values the Legislature of 1925 passed a statute which gave the commission power to select and designate a disinterested expert at the expense of the company applying for an issue of securities or an increase of rates. While the cost of this expert valuation has been considerable, some $460,000 in five years, it has not resulted in increased rates. We have now established figures of sound values for all of the larger electrical properties and much has been accomplished which should result in benefit to the consumers and the companies for, in the last analysis, the interests of the utility and the public are not as conflicting and antagonistic as some people claim. The expense of this expert work for the last two years of the period shows a gratifying decrease of some 65 per cent over the preceding biennium.

This is simply the earnest effort of the commission fairly and efficiently to execute its functions as laid down by the Legislature and to protect both the public and the utilities in seeing to it that the former pays rates that are reasonable and fair and that the latter make a fair return on the sound, not inflated, value of its property.

Notwithstanding a fair and sound valuation and securities issued well within that figure, a company may fail because of incompetent management or exploitation by its holding company in the form of unreasonable and excess management and engineering fees and illegal acts. The public utility business is no different from any other business in that its success is based on the personal equation of the management. The Vermont commission has nothing whatever to do with who are the owners or officials of utility companies.

All, then, that the commission does when it approves a certain security issue is to say, "We think there is sufficient property behind these bonds or stock conservatively valued to cover these securities dollar for dollar at the time of our approval."

From October 1, 1929, to October 1, 1930, the commission in its Central Vermont Public Service Corporation, Green Mountain Power Corporation and Twin State Gas & Electric Company in St. Johnsbury and Brattleboro rate adjustments has caused an annual saving

**From an address before the Springfield, Vt., Chamber of Commerce.*

of $145,000 to residential customers on the basis of the same amount of electricity consumed for the previous year.

The Green Mountain case

The recent sale of all the common stock with voting rights of the Green Mountain Power Corporation to the New England Power Association, as announced by the newspapers on December 1, ought to result in mutual benefits to both corporations and to the public served by Green Mountain. The People's Light & Power Company, the former owner of Green Mountain, was formed several years ago by the W. B. Foshay Company and consisted of many operating companies stretching from Vermont to California. These properties were purchased at excessive prices and the principal object of the project seems to have been the sale of securities. In 1927 the Foshay company sold People's to G. L. Ohrstrom and his associates. Foshay went into receivership in October, 1929, and the Ohrstrom holding companies went into receivership within the last two months. It is good to know that Green Mountain is totally and finally separated from such sponsorship and that in the future is to be connected with the New England Power Association, whose operating companies have developed large and successful hydro-electric plants on the Connecticut and Deerfield Rivers in this state. By this transfer New England Power Association becomes for the first time a large retail distributor of electric service in this state, and I, personally, believe that this will be beneficial to the people of Vermont.

In our decision in 1929 on the petition of incorporators of the Central Vermont Public Service Corporation for its establishment, we said: "We believe that the domestic consumer of electricity has been neglected in the past by the utilities. He uses current after the factory and store have closed for the day, thus contributing materially and beneficially to the well-balanced load for the 24-hour period. He pays more than 64 per cent of the total revenue derived from electric service rendered. Power customers of electricity consume current in such quantities that they may protect themselves against excessive rates by installing their own facilities for the generation of current. This fact creates a competitive situation which tends to induce the utility to keep its rate as low as or lower than the power can be produced by the manufacturer, but the domestic consumer has no recourse save to the oil lamp, Delco system or some similar device for the production of light. The householder was willing to pay practically any price for electric lighting twenty or more years ago when electricity was beginning to be used.

The vast development in the production of electricity, the enormous amounts of capital invested in plant and distribution lines connecting different systems in recent years and the almost universal use of electricity at present have brought no general or widespread reduction in residential rates throughout this state.

Up to the present, owing to inadequacy of appropriation and because we have not yet covered all the residential rates, we have not made a state-wide investigation of power rates, but a recent study of the power rate charged by the Fall Mountain Electric Company, a subsidiary of the New England Power Association, to an industry located in Bellows Falls requiring a 40-kw. demand shows the cost of electric power service at Bellows Falls for the year ended September, 1931, as compared with the cost of similar service of other subsidiaries of the parent company in Massachusetts and Rhode Island to be as follows:

Company	Annual Bill for Power Service
Fall Mountain Electric Company (Bellows Falls)	$2,005.65
The Worcester Electric Light Company	2,153.53
The Narragansett Electric Company	1,806.95
Fall River Electric Light Company	3,193.50
The Lowell Electric Light Corporation	2,925.25
Lawrence Gas & Electric Company	2,891.70
Gardner Electric Light Company	2,265.40

As compared with the cost of such service in the New Hampshire cities of Manchester, Concord and Berlin, Bellows Falls has the lowest rate up to 10,000 kw.-hr. per month except Manchester, which is lower than Bellows Falls only after 8,000 kw.-hr. per month has been exceeded.

According to the best information available, the cost of such service is greater in the Massachusetts cities of Pittsfield, Springfield and North Adams than in Bellows Falls. In Worcester the cost is greater than in Bellows Falls up to 8,000 kw.-hr. per month.

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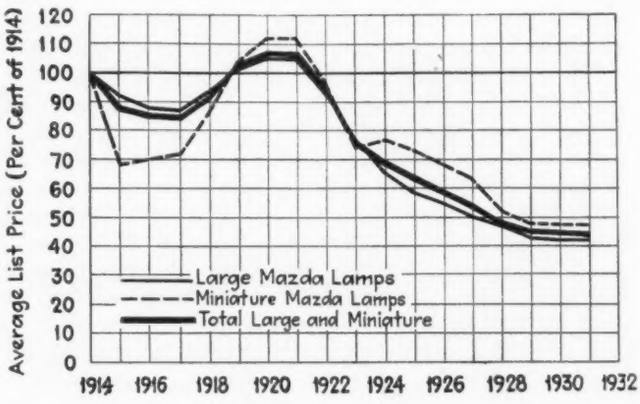
Lamp Prices Steady Since 1929

Average list prices of large lamps computed on the basis of shipments during 1931 and prices as of January 1, 1932, were 43.3 per cent of those in effect in 1914, it is announced by the incandescent lamp department of the General Electric Company. As the curves show, there has been a continuous downward trend throughout



Trend of average list price of domestic "Mazda" lamps

the period here considered, with the exception of a few high-priced years around 1920 and a minor interruption in 1924. Even in the war and early post-war years the increase was much more modest than in most of the commodities that go into the household.

The compilation is based on the principal types of lamps sold in 1914. As any of these became obsolete and new lamps were introduced to take their places the quantities of the new types are extended at the prevailing list prices for the current year and then at the 1914 prices of the corresponding types in 1914. The data

used cover about 80 per cent of the large and miniature "Mazda" lamps sold by the incandescent lamp department of the General Electric Company.

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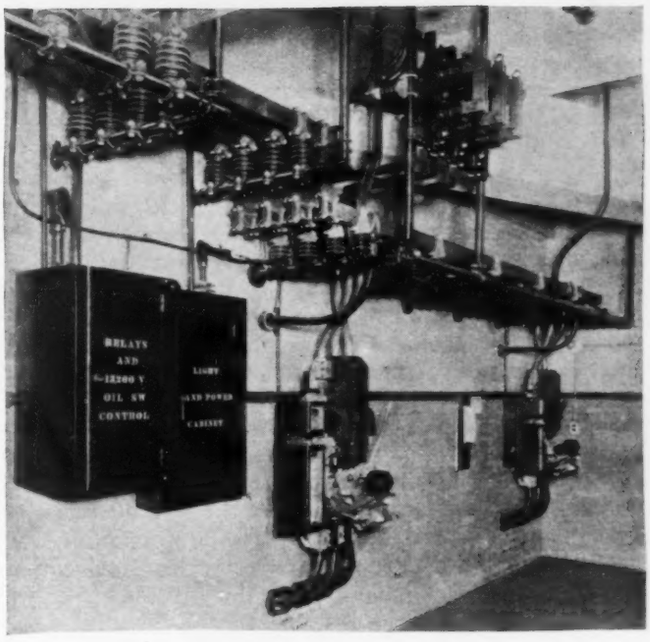
Network Installation Safeguards Telephone Service

Complete reliance upon purchased energy supplied from the network system of the Worcester Electric Light Company features the new exchange and office building of the New England Telephone & Telegraph Company in the second city of Massachusetts. No isolated plant reserve generating units are provided, although it has long been common practice to equip important telephone exchanges with at least one prime mover power unit for battery charging in case of central-station shutdowns. Worcester, a city of 200,000 inhabitants, now depends on energy supplied by the local utility for its vitally essential telephone power, and the developing network of the downtown district, combined with the lighting company's tie connections with the New England Power Association's system, forms the key to the service situation.

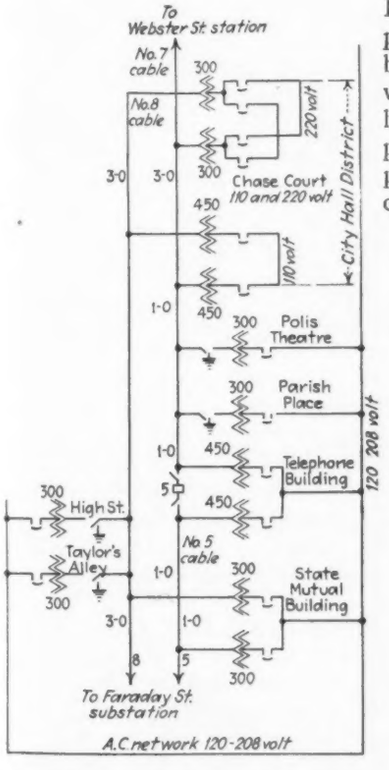
In the basement of the telephone building is a network substation with two 450-kva., three-phase, 13.2-kv. to 120–208-volt transformers supplied with high-tension energy from an underground feeder running between the Webster Street generating plant and the Faraday Street substation. Each of these latter points is connected by other cables and with the New England Power Company system at opposite ends of the city. The usual connections of the telephone building transformers through network protector to the 120–208-volt system provide an additional source of supply in case of feeder trouble or transformer failure at the telephone building itself.

There are thus three major sources of power supply to the telephone company and back of these there are two widely separated system tie-ins with the New England Power Company and its extensive interconnections elsewhere.



Network buses and protectors arranged for ease of access and short cable runs

Connections supplying the telephone company lead from the bus junction in the upper center of the view around the ceiling to the power distributing switchboard of the communication company. The transformers are in separate fireproof vaults back of the wall supporting the protectors, relay and power cabinets.

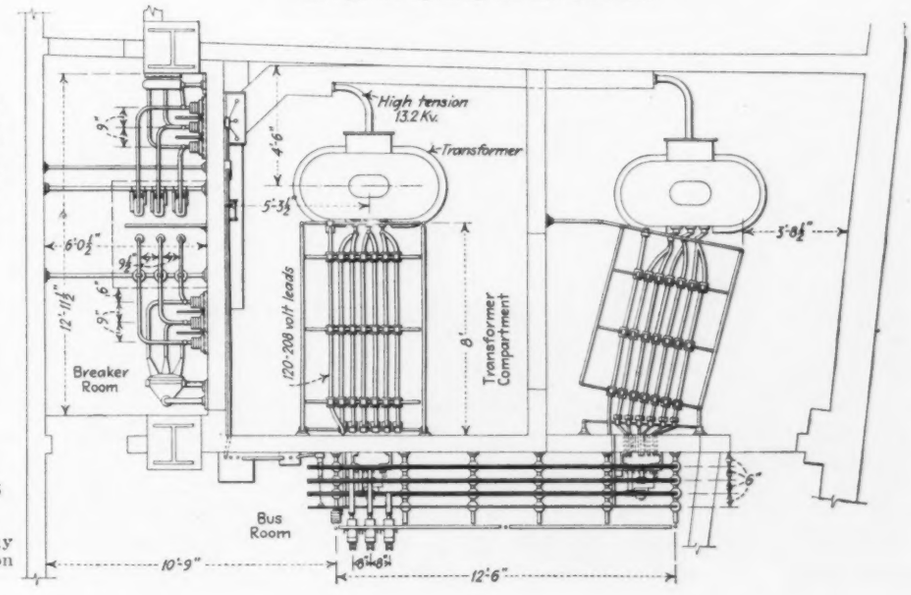


Network provides multiple sources of supply

A temporary sub-network serves the City Hall district from Chase Court substation at 110-220 volts.

Plan of network vault

When installing, the transformers were lowered into the vault through an opening off the sidewalk



Guideposts to Industrial Betterment

TO SET its house in order for 1932, industry in the northeast has just been going through a searching examination of its policies under the auspices of the New England Council, seeking to determine by cross-sectional replies to a confidential questionnaire by what methods business can be improved, net earnings increased and the public welfare bettered. A comparison of the replies of 853 concerns, embracing all kinds of business and manufacturing, with those of eighteen electrical manufacturers and 33 utilities, reveals a consensus of opinion strongly in favor of progressive managerial policies like betterment of sales methods, modernization of equipment, cost reduction, planning for future war against depression, sound banking, price stabilization, increased advertising and keeping the government out of further encroachments into business.

As might be expected, there are marked differences of opinion in regard to some company policies between business concerns in general, electrical manufacturers and utilities. These arise in part from basic economic differences intrinsic in the structure and functioning of the enterprises as classes. In the accompanying table a number of representative questions are presented, with the replies of the three groups expressed in percentages of those answering. Items on which there was fairly general agreement without marked variations of opinion are mainly omitted, the latter being outlined in the text following.

Measures Seeking Improved Profits in 1932

(Computed from New England Council Investigation)

	General Industry in N.E.	Electrical Manufacturers	Public Utilities
Number of concerns replying	853	18	33
	Percentage of those replying favorably		
Reducing expenses other than wages and salaries	70.1	50	72.8
Reducing wages and salaries	33.4	33.3	18.2
Increasing volume of sales	62	72	68.7
New products	49	72.2	18.2
New uses for present products	29.4	16.6	42.5
Increased help to dealers	27	22.2	39.4
Analyses of domestic market sales	34.3	50	51.5
Concentration on most profitable lines of product	43.5	55.5	12.1
Concentration on most profitable customer accounts	33	27.8	24.2
Concentration on most profitable sales territories	28.3	38.9	24.2
Increased advertising	21.2	33.3	33.4
Revision of selling organization	23.8	16.6	33.4
Decreased production costs	62	83.5	45.5
Providing new machinery of greater capacity	28.5	44.5	18.2
Revision of manufacturing layout	21	33.3	6.08
New processes	25.6	44.5	12.1
Reduction of operating costs	53.3	77.5	54.5
Better plant lighting	8.3	11.1	3.04
Improved stores control	15.2	11.1	21.2
Increased safety work	17.8	11.1	36.4
More research for new products and methods	35.8	66.6	18.2

About one-third of the concerns replying favored further reductions of wages and salaries as a means of increasing profits and only 18.2 per cent of the utilities looked upon this as an acceptable policy. The relatively higher stability of utility earnings is doubtless responsible. An encouraging viewpoint in regard to stimulating sales volume is apparent in electrical manufacturing and in utility service. Naturally new products do not originate in any number with the utilities, but the electrical manufacturers showed a keen realization of the value of pioneer developments as trade stimuli, and their percentage increase over general industry might be regarded as a tribute to the progressiveness of the electrical industry, *per se*. New uses for existing products interest the utilities even more than the manufacturers, perhaps because the operating companies are so much closer to the consumer. General agreement exists as to the value of increased advertising, although too small a percentage of the replies evidenced an adequate realization of the business-building powers of paid space.

The utilities appear to be scrutinizing the set-ups of their selling organizations more vigorously than the electrical manufacturers and general industry. The importance of operating economies is widely recognized. Naturally new processes and plant layouts appealed specially to the manufacturers, and the highly developed state of the utility plants, including illumination, apparently showed less to be desired here than in the case of general industry and electrical manufacturing. Improved stores control is receiving relatively more attention in the utility field than elsewhere, as is safety work. That the electrical manufacturers are the leading champions of research is not surprising in view of the record of the electrical industry's factory laboratories during the past score of years, if not longer.

General agreement prevailed among the three groups as to the desirability of accepting definite responsibility in the future for planning to achieve maximum possible security of employment. Eighty-three per cent of the general list, 89.5 per cent of the electrical manufacturers and 96.5 per cent of the utilities favored this policy. The percentage favoring setting up reserves to help maintain weekly incomes of stable forces fell off somewhat in all classes, the utilities favoring this by 75 per cent of the replies and the others by 60 per cent. From 82 to 96 per cent of the replies were opposed to compulsory unemployment insurance established by either state or federal government. Long-time planning and budgeting of sales was favored by about 92 per cent of general business, about two-thirds of the electrical manufacturers and about 70 per cent of the utilities.

Advance (three months) estimates of customers' requirements were favored by about 80 per cent of the electrical manufacturers, 93 per cent of general business and 75 per cent of the utilities. From 80 to 90 per cent of those replying favored shortening weekly hours to conform to available work. General business and electrical manufacturers favored reserving plant expansion for depression periods in 68 and 73 per cent of the cases.

utilities in 62 per cent of the replies. Sixty-nine to 82 per cent favored reserving public works construction for depression periods to provide employment.

Only 17.5 per cent of general business, 5.9 per cent of electrical manufacturers and 3.5 per cent of the utilities supported the policy of restricting the use of labor-saving machinery to increase employment. From 72 to 92 per cent believed in vocational guidance away from decadent industries by educational institutions. From 72 to 90 per cent held that all banks in a Federal Reserve district should be required to become members of the Federal Reserve system. Modification of the anti-trust laws in the interest of price stabilization and against cut-throat competition was favored by about 91 per cent of general business, 87 per cent of electrical manufacturers and 88 per cent of the utilities. About 95 per cent of the business replies, including electrical manufacturers, favored long-time planning by trade associations, broader fact finding and the promotion of scientific management. The utilities registered about 77 per cent here. An insignificant proportion thought that tariffs should be increased, and from 25 to 30 per cent believe that they should be reduced. Eighty-one per cent of general business favored scaling down of war debts, 61 per cent of the electrical manufacturers and 33 per cent of the utilities concurring. About 80 per cent held that the moratorium should be extended.

About half the electrical manufacturers, general business and utility replies favored setting up a national economic council with business and government co-operating, practically all being opposed to a purely governmental economic council and from a third to a half favoring such a council to be run by business alone.

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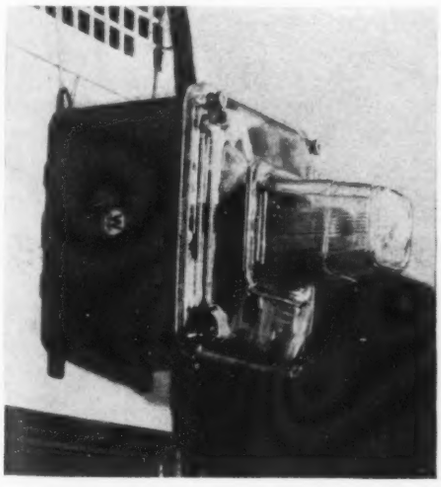
Saving Youthful Eyes

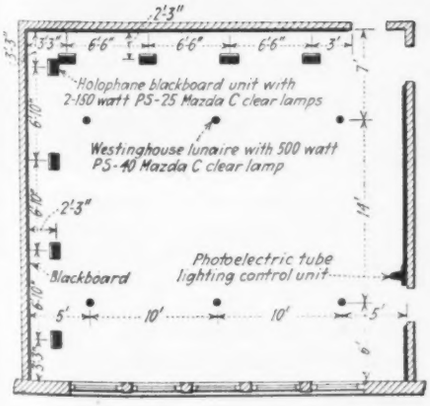
To curb the growth of defective eyesight among school children, the Board of Education of Jersey City, N. J., installed an "eye conservation" room in its new Public School No. 22. Automatic control which maintains a light intensity of 30 foot-candles and special blackboard lighting are used.

Eight special Holophane units, each equipped with two 150-watt, PS-25 lamps and a refracting lens, mounted against the ceiling on 6-ft. 6-in. centers in a row 2 ft. 3 in. from the wall, concentrate light on two blackboards, increasing visibility of chalk notations and removing glaring daylight reflections. Six Westinghouse Lunaire semi-indirect ceiling units equipped with inclosing globes of diffusing glass and 500-watt, PS-40 lamps and mounted 11 ft. 3 in. above the floor on 14x10-ft. centers provide a general illumination of 30 foot-candles on the desk tops. A lighting control unit of the same make with a photoelectric tube turns all lights on and off automatically, maintaining an intensity of 30 foot-candles on the desk tops.

The lighting control unit is located above the blackboard on the wall opposite the windows. Blackboard lights may be operated separately with a manual switch. Sometimes blackboard lighting is desired when general illumination is not, because it removes blackboard "shine" and makes chalk notations easy to see. Automatic control removes human element of judgment in operation of room lighting and assures scientific lighting at all times.

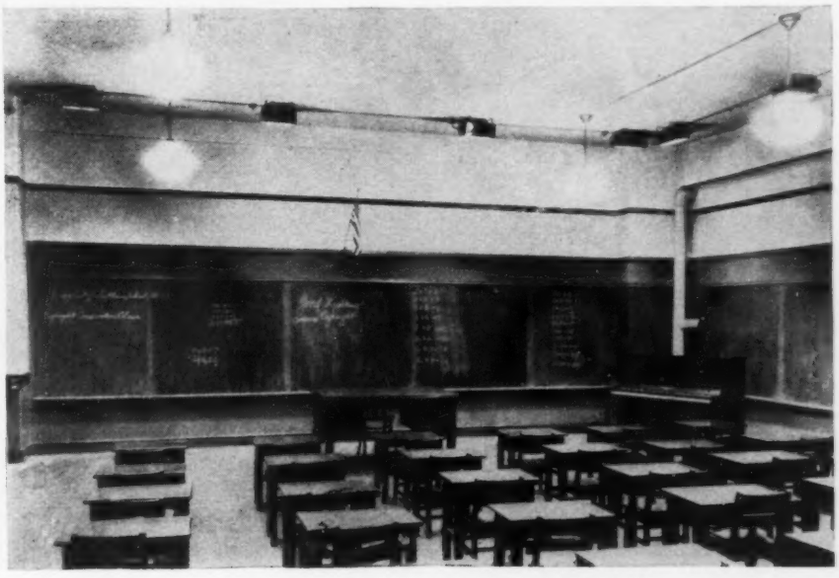


Automatic control which maintains 30-foot-candle light intensity



Arrangement of blackboard and general illumination

Special blackboard lighting and automatic control of general intensity used in this schoolroom



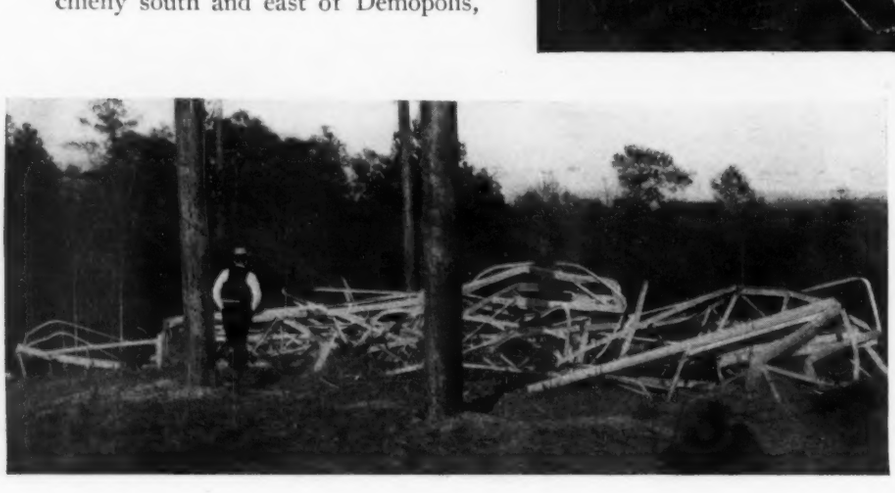
"Don't-climb" sign of little use on this tower
Martin Dam-Anniston line

Some of the Havoc Wrought by A

SEVENTY steel towers and twenty wooden towers on the 110-kv. and 44-kv. transmission system of the Alabama Power Company were demolished by the tornado which swept northeastwardly across the state on March 21, bringing down many miles of line and presenting a repair job of three to four months' duration.

The path of greatest damage followed very nearly a straight line through Demopolis and Sylacauga, although an apparent offshoot headed more to the north, hitting Tuscaloosa and southeast of Huntsville. The transmission line failures occurred chiefly south and east of Demopolis,

Eccentricities of tornado shown by mixture of windfalls and standing timber



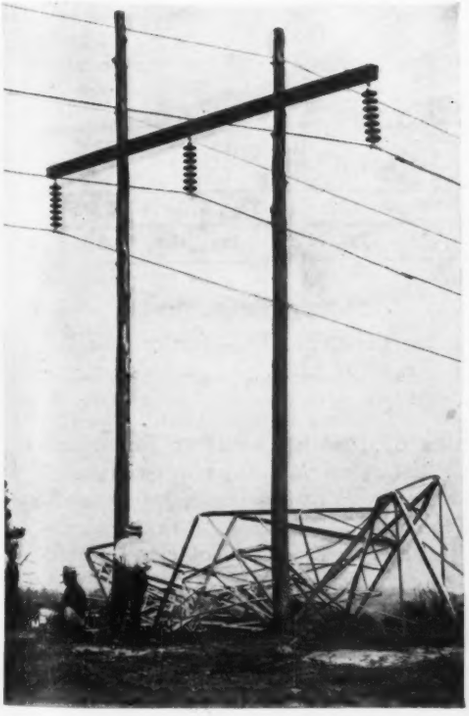
Wood poles support line which this tangled steel tower once carried
Martin Dam-Leeds line

Note wrecked buggy in this crumpled tower

by Alabama Tornado

north of Lock 12, southeast of Sylacauga, south of Jackson Shoals and Anniston. Lines just east and west of Tuscaloosa, and south and east of Huntsville suffered, and sections of two 110-kv. tie lines running into Georgia were wrecked.

As reported in the news of March 26 and April 2, however, prolonged interruptions of service were avoided by rerouting power over the interconnection network and erecting emergency line supports until permanent structures can be installed. The fury of the storm, which is reported to be the worst the Alabama company has ever experienced, is indicated by the accompanying views of crumpled, tangled steel which once supported transmission lines. It is doubtful whether any reasonable factor of safety could have withstood the strain, so it remains an economic question how much can be spent to build lines which will stand up under abnormal conditions.



Type of wooden structure erected to restore service over this line
Martin Dam-Anniston line

Remains of Linden substation

Application of Primary Distribution Fuses

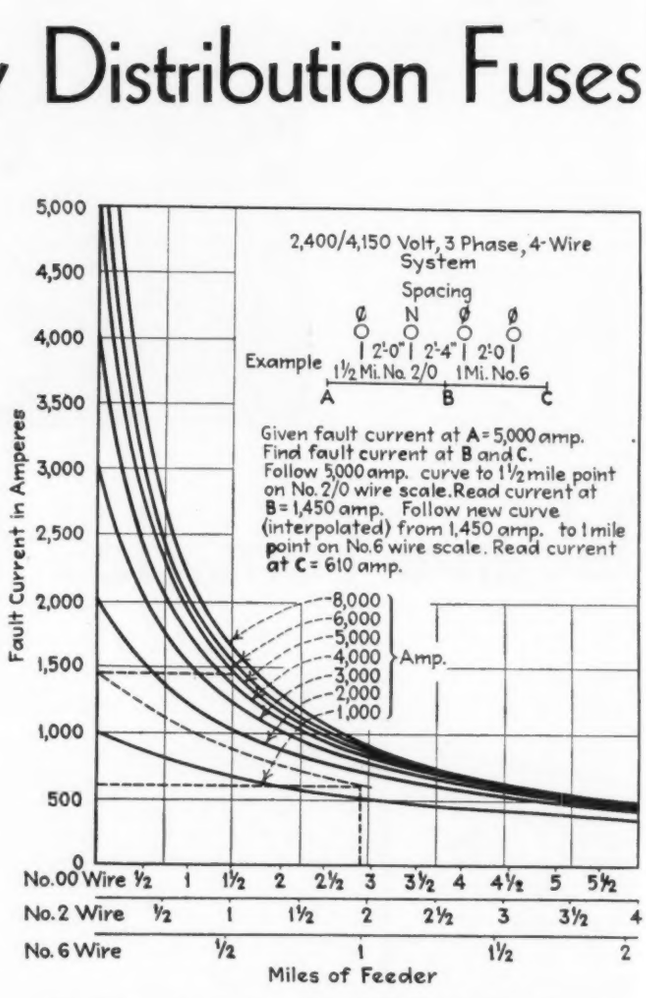
By FRANK E. SANFORD*
Distribution Engineer
Union Gas & Electric Company, Cincinnati, Ohio

TO CLEAR short circuits, protect the system and minimize system disturbances at times of fault are quite generally recognized as the function of the primary fuse. Since the transformer fuse is the first line of defense in cases of transformer failure, that fuse which will clear short-circuit current in the least time is the most desirable. Short time overload should not cause the fuse to blow. Blowing on such overload will cause an interruption to service when the transformer is not in danger of overheating. While the extreme of this may occasionally be close to the danger point of the distribution transformer, it is justified if it results in reduced the number of interruptions to service.

Proper application of fusing requires a determination of the range of short-circuit currents available in various sections of the feeders. The maximum current at times of fault at the outer end of a feeder may be only a few hundred amperes, while near the substation the current may be several thousand amperes. To insure that the fuse will properly interrupt the current without damage to the cut-out or fuse link holder therefore requires a cutout of higher interrupting rating near the station regardless of normal load current. Use of the large cutout for small loads in the low short-circuit current section is obviously an unnecessary expense. The short-circuit current at any point of fault on the distribution feeder is inversely proportional to the total impedance to that point. Since a large number of variables may enter into the calculations of this impedance it is most convenient to generalize as much as possible. The accompanying curves offer a means for obtaining ready approximation value. The ordinates of these curves are short-circuit currents in r.m.s. amperes. The abcissa values are plotted to impedance and lengths of feeder for various sizes of wire are substituted for impedance values. Some error is introduced in the calculating of these curves because of the direct addition of impedance values instead of addition of rectangular components. The values shown are thus maximum current for a symmetrical three-phase fault.

Co-ordination of fuses and relays

Fuses on distribution feeders are in series with protective apparatus and devices all the way back to the generator. All of these protections must be co-ordinated so that they will function in their proper order. This


2,400/4,150 Volt, 3 Phase, 4-Wire System
Spacing
Ø N Ø Ø
2'-0" 2'-4" 2'-0"
Example 1½ Mi. No. 2/0 1 Mi. No. 6
A B C
Given fault current at A = 5,000 amp. Find fault current at B and C. Follow 5,000 amp. curve to 1½ mile point on No. 2/0 wire scale. Read current at B = 1,450 amp. Follow new curve (interpolated) from 1,450 amp. to 1 mile point on No. 6 wire scale. Read current at C = 610 amp.
8,000
6,000
5,000
4,000
3,000
2,000
1,000
Amp.
Fault Current in Amperes
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
No. 00 Wire ½ 1 1½ 2 2½ 3 3½ 4 4½ 5 5½
No. 2 Wire ½ 1 1½ 2 2½ 3 3½ 4
No. 6 Wire ½ 1 1½ 2
Miles of Feeder

Short-circuit currents rise rapidly as feeder source is approached

requires the selection of fuse links having time-current characteristics such that at no value of short-circuit current or other conditions will the main feeder protection function ahead of the fuse at the fault section and, conversely, the relay settings or time-current characteristics of the main feeder protection must be such that under all conditions fuses will be given time enough to clear the fault first. In addition to their co-ordination with other devices preceding them on the system, fuses themselves must be co-ordinated if junctions or branch lines are fused, in which cases transformer fuses are in series with larger junction fuses. Failure to co-ordinate fuses and relays sometimes result in a prolonged feeder outage. Several cases are on record in which fuses failed to clear a fault even on repeated closures of the feeder switch, and it was necessary to patrol the line to find the fault and open the cutout. Proper co-ordination can eliminate practically all such cases.

It is essential after the investigation of fuses and fusing, short-circuit current, co-ordination, etc., to interpret the results and formulate a definite specification for fus-

*Abstract of paper presented at Southwest district meeting, A.I.E.E.

ing on the particular system. Some compromise may be necessary in order that this specification may be applicable throughout a system. While there may be exceptions to any feasible classification or grouping of feeders or sections, further consideration of the particular cases may indicate that it is not advisable to penalize the whole system because of them. Thus it may be found in the tabulation of system characteristics that the short-circuit current is exceptionally high at the substation source of a few feeders, but use of the fault current curve will indicate that this current is rapidly reduced on the feeders so that only a few fused points may fall within the special section.

The fusing specification

For the purpose of the fusing specification the distribution system of the Union Gas & Electric Company and allied companies in the Cincinnati territory is divided roughly into three sections depending on short-circuit current. Approximately 140 feeders are included in this system. In the first, or high short-circuit current section, large porcelain boxes with high interrupting capacity are used at all locations regardless of transformer or normal load size. A check of system characteristics and feeder wire sizes with the fault current variation curves of the accompanying graph indicated that this section would include approximately all No. 20 wire feeders within one-half mile of the substation. The smallest fuse link used in this section is 25 amp.

The second, or medium short-circuit current section, is the most extensive. It includes all points beyond the one-half mile section on No. 20 wire feeders and all points on all other feeders except those in section 3. In this section small type porcelain boxes with 10, 25 or 50-amp. fuse links are used at transformer installations up to 25 kva. Larger installations and junctions are fused with 100-amp. links in the larger-sized porcelain boxes. The third section includes all rural lines and extensions where the short-circuit current is low. Plug type cutouts are used at small installations between phase and neutral in this section, and small type porcelain boxes are used at larger installations and all transformers connected phase to phase and at junction points. Branch lines are fused to rupture a current 50 amp. or greater.

Settings of substation switch relays are arranged as nearly as possible in two groups, dependent on the connections and protection on the high-voltage side. Some limitation is necessary in fuse sizes on these feeders with the lower group relay setting. For this reason a check of the location is made before any fuse larger than 100 amp. is installed. A specification on fuse link operation to conform with the specification for fusing and for relay settings adopted provides that fuse links must carry their rating continuously and must blow within four seconds at 300 per cent of rating and within one second at 500 per cent of rating. Characteristic curves must be based on short-circuit interrupting tests at 80 per cent to unity power factor. At the end of eight hours with rated current flowing the temperature rise measured at the upper contact must not exceed 50 deg. C. over an ambient temperature of 20 to 25 deg. C.

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Advantages and Disadvantages of Four Types of Outdoor Substation Construction

(Excerpt from N.E.L.A. Electrical Apparatus Committee Report No. 164)

Unit Type Structures—These make use of individual units, usually of A-frame design, for each line or transformer connection, are usually of the strain-bus type and are essentially an extension of line construction applied to the substation.

ADVANTAGES

1. Adaptability to uneven topography.
2. Economy in steel structures.
3. Segregation of apparatus.

DISADVANTAGES

1. Large amount of real estate required.
2. Cost of large number of footings.
3. Increased amount of control ducts and cables, station lighting and yard maintenance.

This type is most adaptable to the higher voltages (66 to 132 kv.) with simple wiring diagrams where the cost of real estate is not an appreciable item.

Truss Type Structures—Trussed together with beams or girders which are either latticed or of standard structural shapes.

ADVANTAGES

1. Adaptability to any wiring diagram.
2. Small amount of real estate required.
3. Economy in footings.
4. Over-all economy for the lower voltages (44 kv. and below).
5. Ease of extension.

DISADVANTAGES

1. Hazards of maintenance due to high elevation and the proximity of live parts.
2. Large amount of steel required.
3. More expensive for the higher voltages (66 kv. and above) with simple wiring diagrams unless the cost of real estate is high.
4. Congestion of equipment.

This type is most adaptable to the higher voltages (66 kv. and above) with complicated wiring diagrams and to all stations of the lower voltage class (44 kv. and below).

Flat or Low Type Structure—Those which tend to keep all equipment and buses at a low elevation. They are of the rigid-bus type and are generally constructed of standard structural units.

ADVANTAGES

1. Economy for the higher voltages (66 kv. and above) unless real estate is an appreciable item.
2. Accessibility of equipment.
3. Adaptability to standardization.

DISADVANTAGES

1. Large amount of real estate required.
2. Greater cost of footings and grading, due to the number and scattered locations.
3. Limited to circuit extending in two directions only.

This type is most adaptable to the very high voltages (220 kv.), but is also economical for voltages down to 66 kv., where real estate cost is not excessive.

Pipe Structures—Structural steel of the truss type is replaced with pipe.

ADVANTAGES

1. Economy for the lower voltages, usually of the distribution substation class (13.2 kv. and below).
2. Speed of delivery of material.
3. Reduction of engineering design due to use of pipe clamps for equipment.

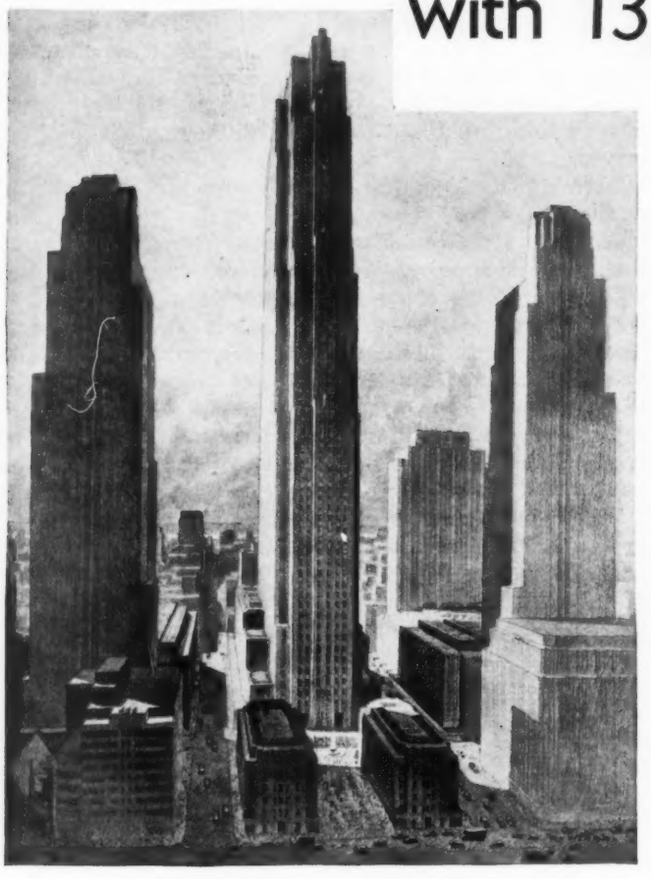
DISADVANTAGES

1. Limitation to low elevations and short spans.
2. Loosening of clamped structural connections, unless welded joints are used.

This type is most adaptable to the lower voltages (13.2 kv. and below) for applications requiring speed in erection and a minimum of structural engineering.

By EUGENE CLUTE

Radio City Starts with 13,000 Kva. Capacity



Seventy-story unit center of radio's three-block city

The view is from Fifth Avenue looking west. The 30-story building to the northwest of the tall central unit is the first to be erected and is now nearing completion.

FOUR multi-bank transformer installations at different levels will be required for the economical supply of electric light and power to Radio City's largest building, which will be also, probably, the world's largest office building because of its large total of floor space. Being 70 stories high, it will not be as tall as the Empire State Building or the Chrysler Building, but the much greater area of its floors and the requirements of the broadcasting studios which it will house will call for a greater number of transformer installations than suffices for either of those buildings.

The magnitude of the project and the unusual character of many of the problems involved make the service plan for Radio City of the greatest interest. Among its features are the following: Special multi-vault construction, isolating each transformer bank, network protector and service bus; a unique system of inner-building conduits for the high-tension feeders; an extensive installation of inter-vault ties, connecting with the street network, and the thorough interconnection of transformer banks. Many other novel elements are co-ordinated in the well-organized scheme which is described below.

Eight high-tension underground feeder cables will enter the property from points as widely separated as possible, some of the manholes being on opposite sides of the bordering streets, so that any fault occurring in one manhole will not affect any other. The horizontal runs in the sub-basement floor fill in building No. 1 (the 70-story building) will be installed in concrete-incased conduits in trenches. Pull chambers will be provided in these trenches at offsets, as the length and stiffness of the cables would otherwise make it difficult to install them, especially around bends. In this building two riser shafts, as widely separated as possible, will carry the feeders to the floors upon which transformer installations will be located. These riser shafts will be provided with splicing chambers and with pull chambers at intervals for anchoring the cables, relieving the strain on the cables due to their own weight. Cable clamps will be provided in the top of each splicing chamber, attached to the lower end of the conduit, to prevent the cable from slipping down the shaft in the event of the cable parting from any cause or in event of the failure of the upper cable support. The collar of this clamp which grips the cable is connected by short lengths of chain to the lower end of the conduit above it in order to permit movement of the cable with temperature changes.

Cable supports for armored cable will be provided at the floor of splicing chambers. The armor of the cable is cut and turned outward and clamped in the galvanized-iron rings of these supports (see ELECTRICAL WORLD, February 14, 1931, page 331). A cable bracket is provided above the cable joint to relieve the joint from the injurious effects of buckling of the cable caused by expansion and contraction under changes of temperature. Hooks are provided for cable-pulling apparatus, each capable of sustaining 6,000 lb. The splicing chambers will have 8-in. fireproof-brick inclosing walls and partitions, fireproof doors in front and a stone concrete barrier at the top.

Taps from the risers will be staggered at alternate splicing chambers, so that continued service is assured in case of a feeder cable failure.

The high-tension feeders will be extended into transformer installations located at load centers. Each transformer bank will be supplied by one of the eight high-tension feeders and the eight feeders will be diversified among the transformer banks in such a manner that their energy supply can be best utilized during varying load and operating conditions.

The voltage of these feeders will be either 13,800 or 27,600, which will be stepped down by the transformers to 120-208 volts for utilization for three-phase, three-wire power and three-phase, four-wire lighting.

Transformer secondaries interconnected

For each of the other large buildings of the Radio City group, including each theater building, there will be a transformer installation located in a vault under the sidewalk between the building and the curb. Inner partition walls and fireproof doors will isolate one transformer bank from another, and in addition will inclose separately each network protector and each service bus.

Removable slabs are provided over all sidewalk vaults for the removal of transformers in case of repair or renewal. Sidewalk gratings, with access door and ladder, are provided for maintenance and ventilation purposes. The portion of the floor of the transformer vault directly under the grating will be surrounded by a concrete curb and sloped to a trapped drain, to take care of rain water coming through the grating. The transformer installation at the basement level of building No. 1 will be made up of banks of three single-phase transformers, and as these units are interchangeable with other transformers their arrangement will be varied in different vaults to meet different space conditions.

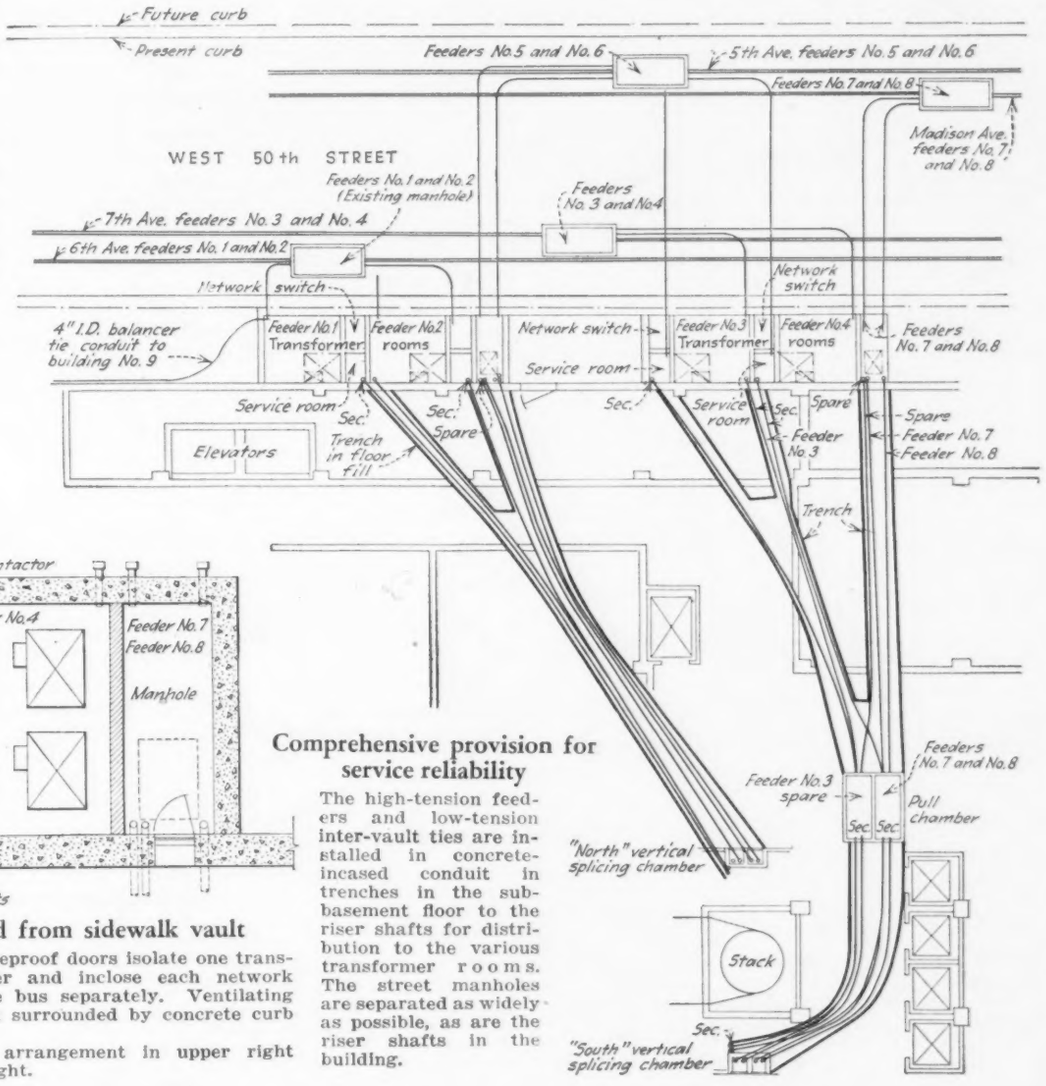
The 70-story building, building No. 1 of the group, will be provided not only with a transformer installation at the basement level but also with multi-vault transformer stations at the sixth, 21st and 55th floors. The loads centering at the fifth and sixth floors, due to the 26 broadcasting studios of the National Broadcasting Company and certain other requirements, render it economical to locate a transformer station at this point in this particular instance.

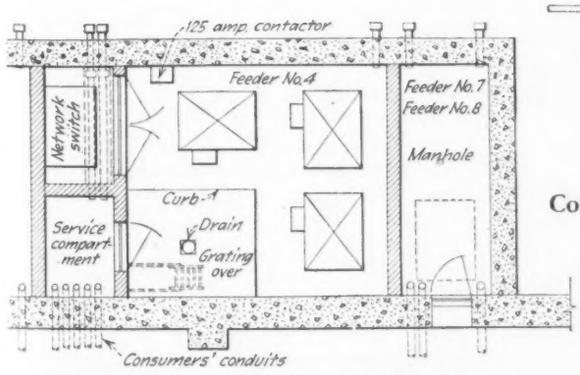
The upper-level transformer installations will be housed in fireproof brick inclosures and ventilated directly to outside air through wall openings. The arrangement and isolation of equipment in these vaults will be similar to that in the sidewalk installations for the other buildings.

A comprehensive interlacing of secondary connections is so arranged within each transformer installation that in the event of failure of one transformer in a bank the other transformers will divide the load until this transformer is restored to service.

Each transformer installation will consist essentially of individual transformer banks, varying from one to five banks, and in bank sizes of 500 kva. or 1,000 kva., depending upon the load requirements of the buildings. There will be an automatic network protector and service bus for each bank.

Energy will be supplied to each service bus by fused cable connections from all transformers of the installa-





Lower floors served from sidewalk vault

Inner partition wall and fireproof doors isolate one transformer bank from another and inclose each network protector and each service bus separately. Ventilating grating has drain below it surrounded by concrete curb to confine rainwater.

A detail of transformer arrangement in upper right vault of diagram at the right.

Comprehensive provision for service reliability

The high-tension feeders and low-tension inter-vault ties are installed in concrete-incased conduit in trenches in the sub-basement floor to the riser shafts for distribution to the various transformer rooms. The street manholes are separated as widely as possible, as are the riser shafts in the building.

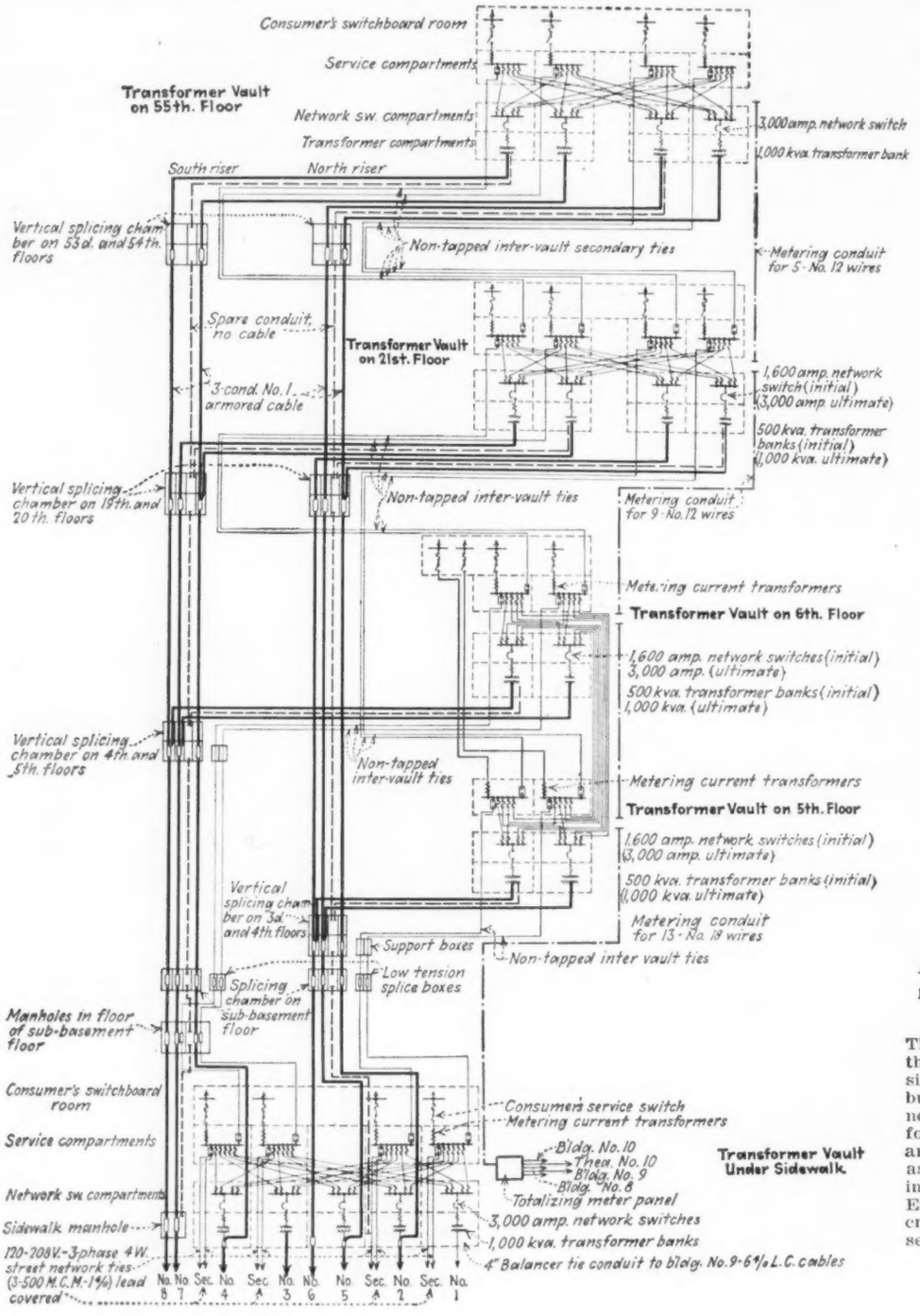
tion through their network protectors, or from a connection with the street network cables in case of a transformer or high-tension feeder cable failure, in which event the network protector will automatically disconnect the transformer bank from the service bus.

Service connections will be run from the service buses to the distribution boards, from which the building will obtain its light and power supply. These switchboards will be installed in close proximity to each of the transformer rooms, to avoid long runs of the service cables to the distribution boards.

From the switchboards upon each floor of building No. 1 where a transformer installation is located feeders will distribute the current to various light and power panels. The light panels will supply current to the ceiling outlets and to the convenience outlets throughout the building. The wiring system is ample whatever system or type of units may be decided upon for illumination.

In the other buildings many and varied utilization requirements must be met, but the supply will be essentially the same in general as that in building No. 1, though adapted to the special conditions in each case.

Alternating-current lighting will be provided throughout Radio City on a three-phase, four-wire basis. By this means, instead of requiring six wires for three

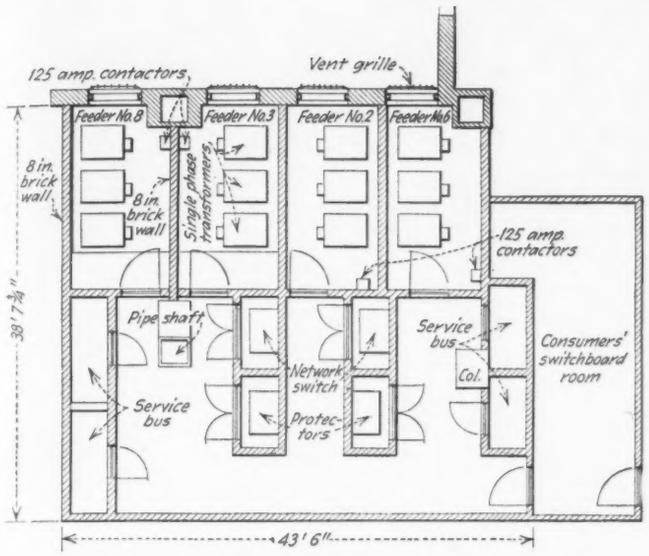

Consumer's switchboard room
Service compartments
Transformer Vault on 55th. Floor
Network sw. compartments
Transformer compartments
3,000 amp. network switch
1,000 kva. transformer bank
South riser
North riser
Vertical splicing chamber on 53d. and 54th. floors
Non-tapped inter-vault secondary ties
Metering conduit for 5-No. 12 wires
Spare conduit, no cable
Transformer Vault on 21st. Floor
3-cond. No. 1 armored cable
1,600 amp. network switch (initial) (3,000 amp. ultimate)
500 kva. transformer banks (initial) (1,000 kva. ultimate)
Vertical splicing chamber on 19th. and 20th. floors
Non-tapped inter-vault ties
Metering conduit for 9-No. 12 wires
Metering current transformers
Transformer Vault on 6th. Floor
1,600 amp. network switches (initial) 3,000 amp. (ultimate)
500 kva. transformer banks (initial) 1,000 kva. (ultimate)
Vertical splicing chamber on 4th. and 5th. floors
Non-tapped inter-vault ties
Metering current transformers
Transformer Vault on 5th. Floor
1,600 amp. network switches (initial) (3,000 amp. ultimate)
500 kva. transformer banks (initial) (1,000 kva. ultimate)
Vertical splicing chamber on 3d. and 4th. floors
Metering conduit for 13-No. 18 wires
Support boxes
Non-tapped inter vault ties
Low tension splice boxes
Splicing chamber on sub-basement floor
Manholes in floor of sub-basement floor
Consumer's switchboard room
Consumer's service switch
Metering current transformers
Service compartments
Bldg. No. 10
Theat. No. 10
Bldg. No. 9
Bldg. No. 8
Transformer Vault Under Sidewalk
Totalizing meter panel
Network sw. compartments
3,000 amp. network switches
Sidewalk manhole
1,000 kva. transformer banks
120-208 V.-3 phase 4 W. street network ties (3-500 M.C.M.-1/16) lead covered
4" Balancer tie conduit to bldg. No. 9-6 1/0 L.C. cables
No. 8
No. 7
Sec. A
No. 4
Sec. A
No. 3
No. 6
No. 5
Sec. A
No. 2
Sec. A
No. 1

All secondaries interconnected to insure service reliability

There are transformer vaults in the basement and at the fifth, sixth, 21st and 55th floors of building No. 1. Secondary connections will tie all of the transformer installations together and with the street network, assuring uninterrupted service in case of a feeder cable failure. Each transformer secondary is cross-tied to several separate service compartment buses.

Five Vaults Handle 7,800 Kva. of Non-Coincident Demand

Vault	Floors Served	Initial Transformer Capacity	Lighting Load in Kw. Number of Circuits	Capacity in Watts	Total	Power Load in Horsepower General	Fire Pumps	D.C. M.G. Sets	Total	Estimated Maximum Demand, Kw.
Sidewalk	to 2nd	5,000	2,648	600	1,748	5,780	200	3,750	9,730	3,800
5th and 6th floors	3rd to 11th	2,000	936	1,000	936	2,000	....	....	2,000	1,100
21st floor	11th to 45th	2,000	2,609	600	1,722	1,450	200	....	1,650	1,200
55th floor	45th to 70th	4,000	2,154	600	1,422	3,368	15	....	3,493	1,700
	Total	13,000	8,347		5,828	12,578	525	3,750	16,873	7,800



Isolation a feature of compact power centers

The transformer and switch vault for the 21st and 55th floors have fireproof brick inclosures ventilated directly to open air through grilled wall openings; inner partitions and fireproof doors isolate transformer banks, network protectors and service buses. The distribution boards feeding the light and power equipment are in all cases located adjacent to the transformer rooms to avoid long runs of the service cables.

circuits, a common neutral is used, making it possible to use four wires instead of six, with the same results. The low-tension power supply will be all on a straight three-phase basis in a network system.

Low-tension inter-vault ties will interconnect the various transformer installations (both sidewalk vaults and upper level vaults) with each other and there will also be 120-208-volt, three-phase, four-wire connections to the street network cable mains. These connections will permit an interchange of energy between the various transformer installations during times of diversity in load requirements among the different buildings and during times of abnormal operating conditions and will make available energy supply from the street network as the occasion may demand.

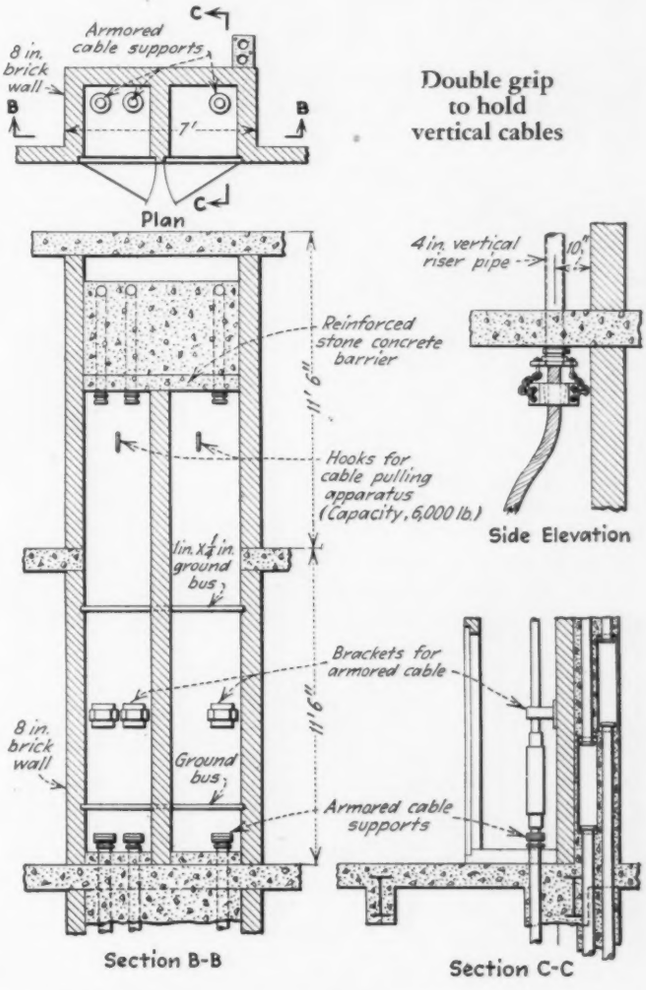
Power from two generating stations

Electric light and power for Radio City will be supplied by the United Electric Light & Power Company through eight high-tension underground feeder cables from various generating stations. These feeders will be served from the Hell Gate station at 132d Street, in the Bronx, and from the Hudson Avenue station, in Brooklyn. They will be diversified between the four bus sections at Hell Gate and the sixteen bus sections at Hudson Avenue, in such a manner as to secure reliability of service in the event of bus section or generator failure at the stations. This represents the maximum reliability available with existing plants. If in the future further segregation of sources is made, these segregations will be rendered available for this development.

The Radio City project includes a theater seating more than 6,000 persons and an adjoining tall office building, also a theater of 3,500 capacity, in addition to the 70-story office building, all of the above being now under construction.

Also, there will be, according to the plan, two 45-story office buildings and various other commercial buildings. A site has been reserved for the Metropolitan Opera House pending a decision upon the suggestion that it be included in this group. The property lies between 48th and 51st Streets and Fifth and Sixth Avenues in mid-Manhattan. It is expected that more than 32,000,000 kw.-hr. of electrical energy will be required annually by this development, representing some 8,000 kw. of demand from the 16,873 kw. of connected load.

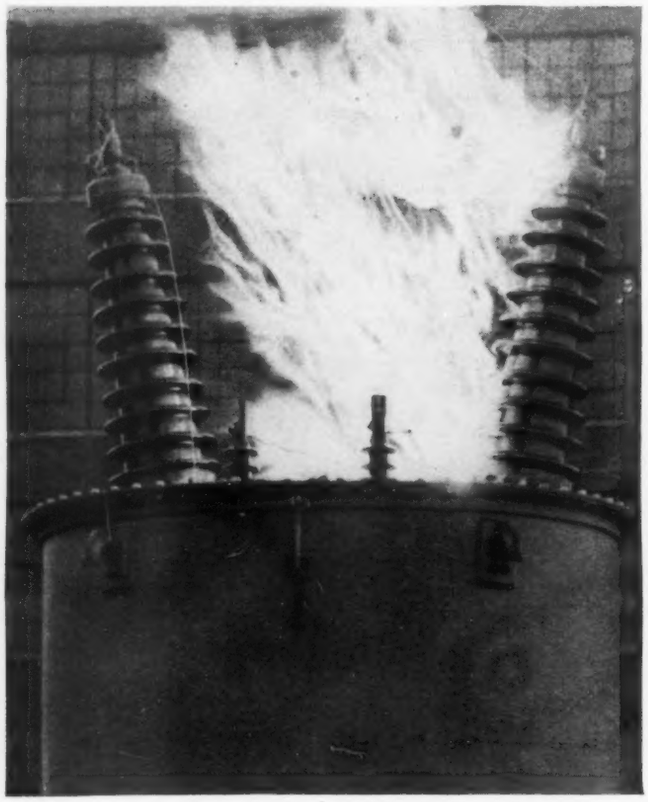
The consulting engineer in charge of the designing and installation of all mechanical and electrical equipment is Clyde R. Place. The holding company is the Metropolitan Square Corporation, with which John D. Rockefeller, Jr., is prominently identified. Reinhard & Hofmeister, Corbett, Harrison & MacMurray and Raymond Hood & Fouilhoux are the associated firms of architects.



Brick-inclosing walls and partition of splicing chamber on 53d and 54th floors have fireproof door in front and stone concrete barrier at top. Hooks are provided for cable-pulling apparatus, each with a capacity of 6,000 lb. Cable brackets to prevent strain in joint of cable due to expansion and contractions of cable with temperature changes are provided above the cable supports for armored cables. Cable clamps are provided at the tops of the splicing chamber where the cable emerges at the lower end of a vertical run; these clamps are attached to the lower end of the conduit to prevent the cable slipping in the event of failure of the suspension clamp at the higher level.

Impulse Testing with Dynamic Power Connected

By H. V. PUTMAN
Manager Transformer Engineering Department, Westinghouse Electric & Manufacturing Company, Sharon, Pa.



Impulse test with dynamic power connected

on a 1,000-kva., 138-kv. core-type transformer. Transformer bushing flashed over, subjecting the winding to the stresses of short circuit as well as to extreme dielectric stress.

THE outstanding characteristic of a new method of testing transformers (ELECTRICAL WORLD, March 5, 1932, page 437) is that the impulse test is applied while the transformer is excited at normal voltage, just as would be the case in actual service. Not only that but the surge is synchronized with the crest of the votage wave, so any fault which the surge might develop within the winding or the insulation would immediately be subjected to the maximum dynamic voltage available. The test, therefore, represents the worst possible condition which could occur in service. Any failure which might give trouble in service would immediately be detected by the flow of dynamic power into the fault developed by the surge.

This kind of a test is a convincing demonstration of impulse strength because it duplicates the exact conditions under which a transformer must withstand surges in service. There can be no more question of whether the transformer has successfully withstood the test than in the case of the ordinary overpotential dielectric tests at low frequency. In either case the presence of a failure is known by the obvious effect of the dynamic power flowing into the fault.

Synchronizing not difficult

The problem of synchronizing the surges with the power voltage is relatively simple. The diagram shows the connections between the surge generator, the transformer under test and the tripping transformer used for synchronizing the discharge of the surge generator with crest of the voltage wave. The operation is as follows: The tripping condenser, C_t, is charged from a direct-current source; actually, the cathode supply of the cathode-ray oscillograph. This condenser may be charged either positively or negatively, depending upon the polarity of the impulse desired. The discharge of the surge generator is initiated by closing the switch S. This places an alternating potential of a magnitude established by the tripping transformer across sphere gap 2, while the voltage across gap 1 is the sum of the d.c. voltage established by the charge on the tripping condenser C_t and the a.c. voltage established across gap 2 by the tripping transformer. (These voltages are illustrated in Fig. 2.) Gap 1 is so adjusted that when the voltage across it reaches a maximum, which will obviously occur on the crest of the voltage wave, there is just sufficient voltage to discharge this gap. When this takes place the charge on the tripping condenser C_t finds its way to ground through gaps 1 and 2 and then through the resistance, r, of the tripping circuit of the surge generator. The several condensers, C_1, C_2, C_3, etc., of the surge generator have been charged by the "neotron" charging unit. The discharge of the tripping condenser C_t through the resistance, r, establishes a small increase in the potential across gap 3, which is just sufficient to produce a discharge and thereby initiate the discharge of the entire surge generator. It is apparent, therefore, that closing switch S will initiate a discharge of the surge generator at the crest of the 60-cycle voltage wave.

An oscillogram shows the 60-cycle voltage impressed on the transformer and the surge taking place on the crest of the wave. While the surge is of too short duration to appear on the film, the sudden drop in voltage due to the sudden initiation of the short-circuit current is clearly apparent. The beginning of the short-circuit current at the crest of the voltage wave is also clearly shown in the oscillogram.

With this experimental circuit impulse voltage tests with dynamic power connected have been made on distribution transformers for the last two years. But in

attempting to apply this method to high-voltage power transformers a real problem is encountered in the protection of the surge generator. For example, a resistance of about 9,000 ohms is used across the surge generator to control the length of the wave (indicated at *R* in Fig. 1). In testing a 220,000-volt transformer voltages to ground of 127,000 volts would be encountered. This would result in a great amount of power and current in the resistance. For instance, if the voltage were maintained 14 amp. would flow, representing about 1,800 kva., which would burn up the resistance in a few cycles.

The solution to this problem lies in the use of a device which does not affect the surge voltage, but does prevent the 60-cycle voltage from passing back into the surge generator discharge resistance. This device is the Torok tube, in a modified form. It has been found that this does not affect the surge passing through it, but does interrupt the circuit after ½ cycle of dynamic current has passed. This prevents injury to the surge generator without removing the dynamic voltage from the transformer under test. There is no appreciable effect on the shape or magnitude of the applied surge, due to the use of the Deïon gap for the protection of the surge generator (Fig. 4).

It is thus practicable to make witness acceptance tests by combining impulse voltages with normal voltages under the worst conditions to be expected in service. If impulse voltages of sufficient magnitude to flash over the transformer bushings are used during the test the winding will be subjected to the mechanical forces of short circuit at the same moment it is called upon to withstand the most severe dielectric stresses which it is liable to encounter in service. Obviously, a transformer which can withstand repeated tests of this character, subjecting the insulation simultaneously to the mechanical stresses incident to short circuit and to the maximum electrical stresses due to the combined impulse and 60-cycle voltages, should stand up satisfactorily in service.

It has long been recognized that the present A.I.E.E. dielectric tests do not form an adequate basis for the design of transformer insulation, and that the ability of a transformer to pass these tests gives no guarantee that

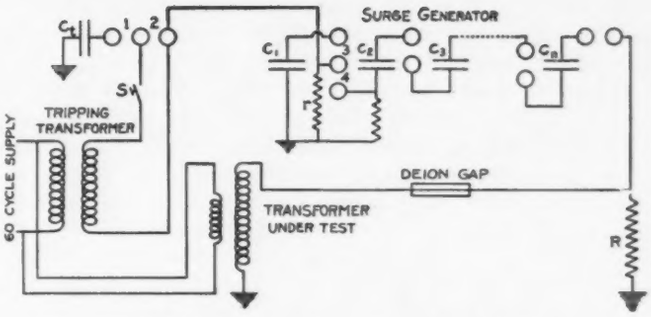
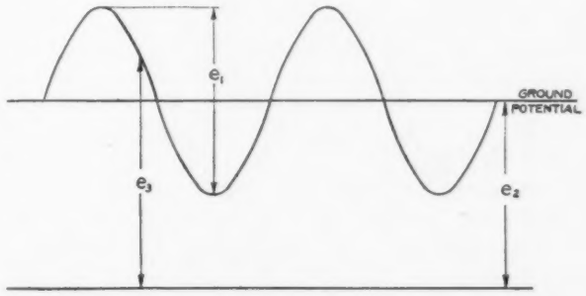


Fig. 1—Tripping transformer synchronizes surges with crest of 60-cycle wave



e_1 = A.C. VOLTAGE PRODUCED BY TRIPPING TRANSFORMER ACROSS GAP 2
e_2 = D.C. VOLTAGE ACROSS TRIPPING CONDENSER C_t
e_3 = VOLTAGE ACROSS GAP 1, SUM OF $e_1 + e_2$

Fig. 2—Voltages of tripping transformer and condenser add

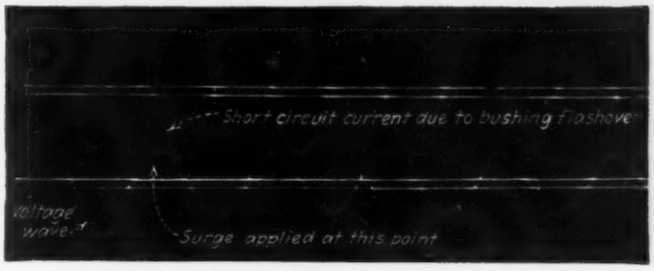
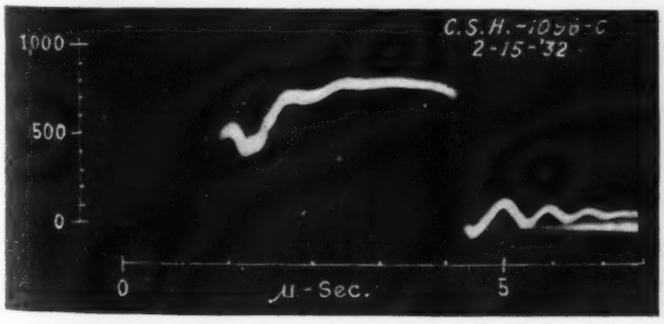


Fig. 3—Synchronization of surge with crest of 60-cycle voltage

This oscillogram was taken at the time of a bushing flashover on a 138,000-volt transformer. The upper record is primary current and the lower record is primary voltage. It indicates clearly the instant of the surge and the start of the arc by the short-circuit current and by the drop in primary voltage due to regulation. Note the formation of the arc at exactly the crest of the wave.



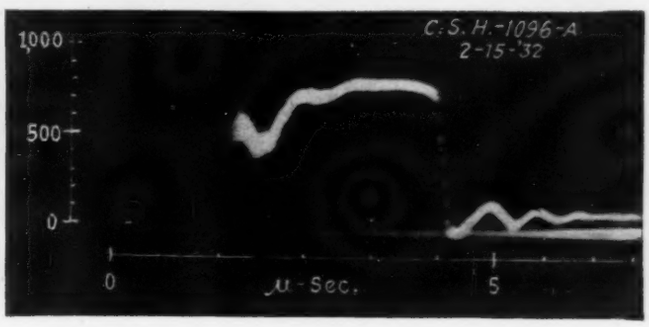


Fig. 4—Deïon gap does not affect shape or magnitude of surge voltage applied

Oscillogram 1096-A shows a surge on the transformer without the Deïon gap. Oscillogram 1096-C shows the same surge on the transformer with the Deïon gap. Note that voltage and time lag of voltage flashover are practically the same. Since the oscillogram is taken between the surge generator and the Deïon gap it indicates that the effect of the gap is negligible.

it can withstand the surge voltages it may encounter in service. There are two reasons for this:

First, in many transformers surge voltages tend to pile up at the line ends of the high-voltage windings and they also produce internal oscillations which may result in high voltages between certain points in the high-voltage winding and ground. In ordinary dielectric tests the voltages induced in the winding are uniformly distributed between the turns and are therefore not representative of the stress conditions produced by surges.

The second reason is that insulation structures, such as are used for insulating the high-voltage winding, as a whole, from ground, having the same low frequency dielectric strength, may have widely different impulse strengths, depending on the relative amounts of creepage surfaces used in the design of the insulation structures.

For these reasons engineers have felt it necessary to develop impulse testing on a practical basis to prove the adequacy of transformer insulation for service conditions. Field studies of natural lightning have furnished valuable information as to the magnitudes and wave shapes of surges occurring on overhead lines as a result of lightning. In making impulse tests the object is simply to apply similar surges in the laboratory by means of a surge generator. In attempting this one of the problems encountered was that of detecting insulation failures due to the impulse voltages. The method of testing described above, in which surge tests are made with the transformer exciter, solved this problem, but introduced a new problem of protecting the surge generator, which was in turn solved by the use of the Torok tube.

The practical difficulties of making impulse tests appear to have been overcome and the way is now clear for the A.I.E.E. to recommend standards for impulse testing. These tests will form a basis of insulation design which will insure the design of transformers quite as able to withstand the surges encountered in service as the normal operating voltage.

Credit for developing this practical method for impulse testing with dynamic power connected is due to F. J. Vogel, insulation development engineer.

Hydro Intake Over Rough Terrain in France

To convey water to one of the hydro plants in Savoy, France, it was necessary to run the conduit over very rugged terrain. In most places it is supported by masonry pillars, some as high as 30 ft., struts and ties like those shown being used to permit using a light sheet-iron trough without placing masonry supports too close together. In crossing one ravine the trough is supported by catenary cables. The conduit, composed of $\frac{3}{32}$-in. plate, is 4 sq.ft. in cross-section and is stiffened with angle irons along the upper edges. Rubber expansion joints are used at intervals. Some trouble was experienced with ice jamming at angles in the conduit and obstructing flow, according to René P. Chauvet, Morges, Switzerland.

Illustrations of some of the construction used on this installation are shown below.

An angle in conduit where ice jam obstructed flow

Standard channel supported from masonry pillars by struts and ties

110-span supported by catenary cable

The Range That Nobody Knows

By REESE MILLS
Manager Range Division
Westinghouse Electric & Manufacturing Company,
Mansfield, Ohio

The electrical industry is thoroughly familiar with the comparatively slow rate at which electric range sales have grown since they were introduced. The reasons for this slowness may be classified under two major heads. The first is that the electrical industry itself, and this includes the electric range manufacturers, has not thoroughly appreciated all of the advantages which the electric range offers to the user, and the public has got a mistaken idea about the electric range so strongly intrenched in its mind that the electric range meets tremendous sales resistance when it is mentioned.

MOST of the common knowledge of the electric range is erroneous. The general public thinks that the electric range is slow, that it costs too much to operate and that the price of the product is too high. The electric range manufacturers have recognized this state of public mind for a long time, but have never been able to finance an educational campaign to combat these impressions because of the limited market and the expense of pioneering.

This situation would not exist today if economical electric cooking rates were universally available. From a few isolated centers economical electric cooking rates have spread only slowly, until today between 11,000,000 and 13,000,000 homes can buy current for cooking at a rate which makes the use of the electric range economical. This means that today only a little more than half of the United States is a market for electric ranges, and as we look back over the history of our efforts we see how comparatively slow and gradual has been the growth on the market on which the manufacturers have gone to work.

Had any manufacturer or group of manufacturers attempted in years past to conduct a national educational advertising campaign in behalf of the electric range almost 50 per cent of the money would have been wasted, because messages in favor of the electric range would have fallen in territory where ranges could not have been sold because of rates. It is safe to assume, therefore, that 50 per cent of the members of the electrical industry have the same erroneous ideas about the electric range that so many range prospects have.

Electric ranges are neither slow nor expensive to buy and use

The public thinks that the electric range is too slow. In the early days electric ranges were slow. Inadequate distribution systems made it impossible for the range manufacturer to put sufficient wattage into his heating elements to speed them up. The heating elements themselves were neither as fast nor as efficient as they are today and voltage conditions in many localities made the electric range unbearably slow. The electric range of 1932 is not slow. Wattage has been increased, but, most of all, the efficiency of the unit and the speed with which a given wattage heats the unit up has been so much improved that the subject of speed may be dismissed with a challenge to any fuel type stove to produce any recipe any quicker than it may be produced on our electric range.

The public thinks that the cost of operating an electric range is too high. There are two reasons why it has gained this impression. The first reason is that in some cases the owners of electric ranges have attempted to operate them in localities where there was not an economical cooking rate available. Enormously high bills have resulted and, since bad news travels faster than good news, hundreds of thousands of people think they know of examples where the cost of operating an electric range is too high. The other reason that this impression has got a foothold is that electric ranges have been sold and installed and put into use without adequate provision being made for instructing the user in the most economical methods of operating the range. The public utilities and dealers who have been most successful in selling electric ranges in volume may attribute much of this success to well-organized home service departments, which see to it that each new user is properly instructed. This activity, plus cooking schools and mass demonstrations, has wiped out the impression of high cost of operation in many localities.

In many localities where the electric range is not well known the public has the impression that the cost of the product is too high. Efficient electric ranges which will

give long service cannot be manufactured and sold at prices as low as some of the cheaper and less efficient fuel ranges which are on the market today. However, it is most interesting to go shopping for a gas stove or an oil stove with the quality and finish of most of the electric ranges on the market today. One will be surprised at how the electric range compares in price with fuel stoves of comparable merit.

Since we are talking about selling electric ranges in increasing quantities, it is well to stop and think about what the range salesman faces when he goes out to call upon a prospect. He finds in every case that the prospect has some sort of cooking device in the house and that she is more or less satisfied with it. His knowledge of the buying habits of people tells him two things: First, it tells him that if the prospect were actually convinced of the need for a new cooking device she would be shopping for one.

More important than that, the salesman's knowledge of the buying habits of the public tells him that in trying to make an electric range sale his competition will not be restricted entirely to fuel type stoves.

All of our incomes are more or less regular and fixed. A certain amount each month must be paid out for rent or investment in the home, a certain amount must go for heat and light, a certain amount for the ordinary kind of clothing and a certain amount for the staple foods that feed the family. There is a small amount left, and that money may be used to buy conveniences, labor-saving devices, luxuries and the many things which are offered for sale continuously. Either you or I or the housewife upon whom the salesman is calling has, over a period of days, weeks or months, had built up in his or her mind a desire for something that that extra money will purchase. We may want a new cooking stove, but, on the other hand, we may want a new automobile or a new overcoat or a new set of furniture, or we may be planning a trip. The point is that the chief competitor of the electric range salesman is the automobile dealer. The next chief competitor is the gasoline station and the tire store, and other competitors which must be recognized are jewelry stores, furniture stores and, in fact, all the merchants who operate in the area in which the prospect spends his or her money.

The range salesman, therefore, must recognize that his task is that of diverting money from the purchase of anything or everything else to the purchase of an electric range.

This makes the sales problem broader, but at the same time it makes it possible for the range salesman to appeal to more motives than would be possible if his competition were limited to other types of cooking devices.

The problem of the salesman, therefore, is first to attract the attention of the prospect to the electric range and electric cookery and divert it from the thing that she has been planing to spend her money for. He then has the task of arousing her interest, and finally of creating a desire for the product sufficiently strong to make her want it more than she wants the money that it takes to buy it or more than she wants some other merchandise that the same amount of money will buy.

In presenting these things we are thinking in terms of the presentation of a retail salesman to a prospective purchaser. This article is not an attack upon any industry or type of non-electric range. Each industry has a selling job to do, and no selling job can be effective when it diverts its energy from making retail sales to an unprofitable controversy in print.

In looking the facts in the face it would seem reasonable that if this salesman can convince the prospect that the electric range will cook better food, serve her better by saving her work and, last of all, actually save her money, he has a very fine chance to get the order. These three things may be definitely proved on behalf of an electric range, and if the electrical industry is convinced of them electric ranges will be sold in much greater volume, more kilowatt-hours will be consumed and more products which go along with the electric range will find their way into use.

Electric range will preserve flavor better

An electric range will cook better food. This is hard to demonstrate on paper and the idea is difficult to convey, but any one who has never sunk his teeth into a roast of beef cooked in an electric oven has no way of visualizing the improvement in flavor resulting from electric oven cooking and no way of contrasting the result with the semi-dried-out, hard-shelled variety of meat which so often comes out of a fuel type oven. However, one glance at the beautifully browned, richly caramelized exterior of the meat, one whiff of the savor of the deliciously done roast and one taste of the juicy, deliciously flavored meat is convincing. One who has never sat down to carve a chicken or turkey cooked to a turn without basting or watching in an electric oven, and who has never watched the juices run out as the leg is sliced off, is unappreciative of the difference.

The housewife has a tremendous, three-times-a-day, 365-days-a-year task of tempting the appetites and nourishing the bodies of those in her care, and when she sees how in meat cookery alone her task is made easier because of the increased palatability, digestibility and nutritive value resulting from the semi-airtight electric oven cooking she becomes vitally interested.

The sink is the best fed thing in the average family. For years our cooks have been boiling our vegetables in large quantities of water on the surface of fuel type stoves, and just when the vegetables have been mashed out of shape by violent boiling and when a large portion of the mineral salts and vitamins have been cooked out of them the utensils have been taken to the sink and these vital food elements have been poured down the sink with the excess water. Modern waterless cookery which steeps the vegetables in their own natural moisture has been made universally possible and more than ever practical by the electric range. The even, easily regulated, confined heat both in the oven and on the surface of an electric range makes waterless cookery a practical ideal and so the electric range produces better food as far as vegetables are concerned.

Certainty and uniformity of results one of the best points

There is hardly any one who cannot remember a mother's or a sister's complaint that her cake had fallen because the oven was too hot or too cold, or that something special did not turn out right because of something having to do with the stove. Those same mothers and sisters are particularly attracted to the electric range because it is easily possible to duplicate results time after

time without a failure. The heat generated by the electric unit is even, but more than that it may be accurately controlled and a control set at a given temperature will produce that same temperature time after time. If an electric range had no other advantage, the housewife who loves to bake cakes and pies and bread would be attracted to it because it practically eliminates the failures which are the largest cooking crosses that she has to bear.

An electric range will produce better food, but it will also serve you better—save you work.

No one of us would go back to the tallow candle, oil lamp or the gas jet for illumination. The convenience of being able to get light at the snap of a switch means much to us. Nor would any housewife who has once found it possible to turn on the heat in an electric range by the mere snapping of a switch ever for a moment consider going back to the matches and the coal and kindling which go with the fuel type stove.

A woman hates dirt. She fights it from morning till night. She's always interested in anything that will help in her daily battle against it. An electric range appeals to her because electric heat is as clean as sunlight, and the electric range may be kept as clean as a china plate. When the electric range comes in there are no more wicks to clean. There are no more ashes to carry out or coal to carry in. There are no more burners to be boiled out with lye. The bottoms of pots and pans no longer need scouring because a pan may be taken off of an electric heating unit and placed on a snowy-white tablecloth without leaving a smudge. The draperies and walls in the kitchen do not get dirty as quickly and the job of cleaning them is much easier when the electric range is used for cooking.

The electric range serves you better because of its healthfulness. Electric heat takes no oxygen from the air because there is no flame and no combustion. The air is not devitalized, nor is it permeated with the fumes of combustion or many of the vapors common to the fuel type stove.

The electric range serves you better because it is cooler. The heat within the oven and even on surface unit is confined to the job of cooking the food and is not dissipated to heat the kitchen and the cook.

One other big advantage of the electric range is safety. This is a part, however, which must be handled with a great deal of care and common sense. Any program of electric range selling must be a constructive program and there are so many constructive advantages to the electric range that it is not necessary to play up one big feature in its favor which might be destructive to the cause of other types of stoves. The electric range is safe, however, and the statement of its safety may be confined to the remark that no tragedy has yet been attributed to it. This is an advantage and an item of better service that undoubtedly appeals to millions of families, especially those which have children.

Don't overlook the appeal of "pride of ownership"

One of the strongest buying motives is the desire to satisfy pride. Most of us trade in our automobiles before they are worn out. Most of buy new shoes and clothes before we have got all of the wear out of them. The electric range has a powerful appeal to this buying motive called "pride," because with the modern high-quality, beautifully finished electric ranges that are offered for sale today goes the knowledge that no person, however rich, can have a better or more modern cooking device than the modern high-quality, moderately priced electric range. No one but a housewife who has spent hours cleaning a fuel type stove, basting the meat in the oven, regulating the heat as the cooking process goes on and staying at home when a "big" dinner is scheduled for the evening can appreciate the automatic control available on the modern electric range. It is possible today to put a complete meal, including meat, vegetables and a cooked dessert, into an electric range early in the morning. The clock may be set to turn the current on far enough in advance of serving time to insure perfect results; the range completes the cooking operation and turns itself off when the food is done, and the housewife, who may have been working in other parts of the house or who may have been away from home enjoying herself, returns to find the meal completely done, piping hot and ready to serve, and cooked with a deliciousness which could not have been improved had she been there personally to supervise the cooking of these individual things. The automatic electric range of today eliminates the slavery to a stove which has been one of the curses of housekeeping. A very large percentage of the million women who use electric ranges today have purchased them because of this automatic feature.

It is well enough that an electric range produces better food and it is well enough that it serves you better by saving you work, but

> **the thing which the public has not realized and which the electrical industry does not seem to know is that the electric range will actually save you money.**

Any housewife will tell you that meat will shrink at least 30 per cent in the ordinary ventilated oven of a fuel type stove. Without attempting to get into any controversy which involves a few ounces or a few cents, it is safe to say that the electric range reduces this shrinkage at least 50 per cent and therefore that 15 per cent of the monthly meat bill may be credited to the electric range as a definite saving.

It is, of course, not possible to figure in dollars and cents the actual value of the vitamins and mineral salts which are being poured down sinks in millions of homes today and which might be saved by waterless cookery or the electric range. Many more savings which can be credited to an electric range can be figured in a personal interview with the housewife, who has at her finger tips her food cost, fuel cost, etc. However, one very definite and tangible saving an electric range will make in the home is in the cost of redecorating the kitchen. Because of the cleanliness of electric heat and because it is confined to the food and not to the room, the cost of redecorating a kitchen over a period of time is easily reduced two-thirds by the electric range.

A very tangible saving is made in the scouring materials used on the bottom of pots and pans, and there are other details which may be figured accurately.

Any husband will be willing to admit that the time his wife spends in the kitchen tending a stove is worth 30 cents an hour. But if you will evaluate this time at only 10 cents an hour and figure the time that the electric range makes it possible for the housewife to be out of the kitchen doing other, more pleasant and profitable

work or preserving her health by relaxation and recreation, you have a very tangible saving to be credited to the electric range. In this day, when there are so many demands upon the housewife's time, time is money.

Without any doubt the advantages of the electric range and electric cookery to the user are so outstanding that a properly organized and co-ordinated commercial activity will produce results.

When national advertising has begun to do its educational job, when distributors have made modern, up-to-date sales methods available, when local retailers have taken the necessary steps to contact their public and when retail salesmen have been trained to deliver the message effectively the sale of electric ranges is going to be rapidly accelerated.

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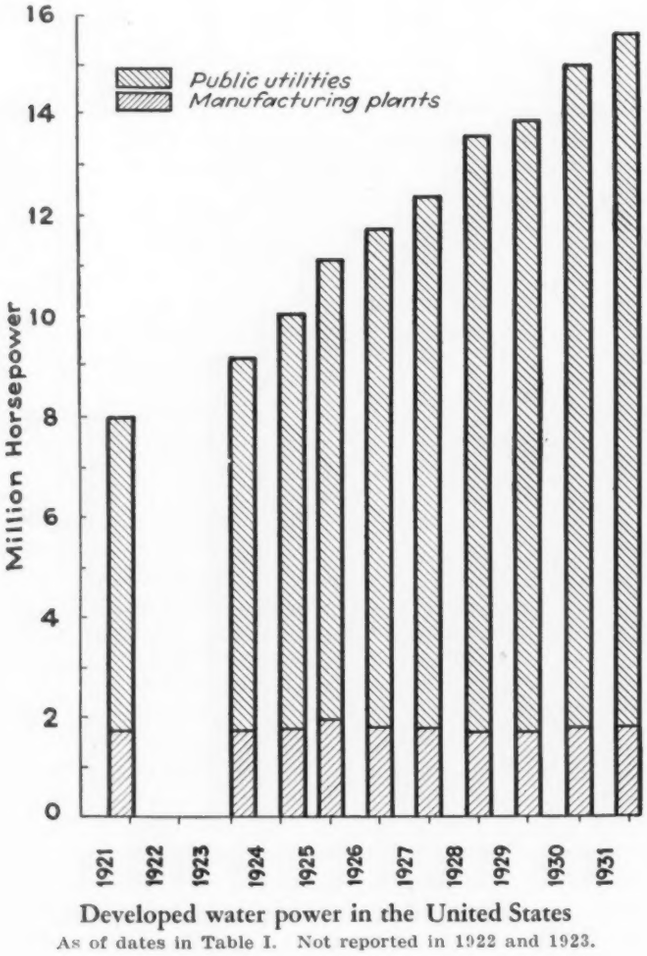
Water Power One-Fifth Utilized

Water-power plants of 100 hp. or larger in the United States had an aggregate capacity of 15,562,805 hp. as of January 1, 1932, the Geological Survey reports. The completion of new plants continued during 1931, though at a reduced rate, the increase being 680,930 hp., or 4.3 per cent.



Developed water power in the United States

As of dates in Table I. Not reported in 1922 and 1923.

An estimate based on present practice in the installation of waterwheels for the utilization of water-power sites shows that waterwheels having a capacity of about 80,000,000 hp. would be required to develop all the water power in the United States. Therefore, about 19½ per cent is now being utilized.

In a decade the total has about doubled, though the increase has not been uniform (Table I). Some years show much greater changes than others, as for example, when several important plants happened to go into operation within a given twelvemonth. The aggregate installation in manufacturing plants has undergone very little change; the increase has been in public utility plants.

In the country as a whole industrial water-power plants comprise only 11.2 per cent of the entire installed capacity. In the South and West the percentage runs lower, whereas in New England it runs up to 40 per cent (Table II). In Maine the installations in the two classes, public utility and manufacturing, are nearly equal; in Massachusetts the latter predominates, with 202,912 hp. in a total of 362,123 hp.

Two-thirds, nearly, of the country's total is to be found in ten states; California is far in the lead, with 15.5 per cent (Table III).

Table I—Installed Horsepower of Water-Power Plants at Various Dates

Date	Public Utility	Manufacturing	Total	Increase — Horsepower	Increase — Per Cent
1921 (Nov.)	6,200,380	1,726,578	7,926,958	.....	.....
1924 (March)	7,348,197	1,738,761	9,086,958	1,160,000*	14.6*
1925 (March)	8,287,332	1,750,323	10,037,655	958,697	10.5
1926 (Jan. 1)	9,259,972	1,916,624	11,176,596	1,138,941†	11.3†
1927 (Jan. 1)	9,961,202‡	1,759,781‡	11,720,983	544,387	4.9
1928 (Jan. 1)	10,538,381	1,757,619	12,296,000	575,017	4.9
1929 (Jan. 1)	11,886,336	1,685,194	13,571,530	1,275,530	10.4
1930 (Jan. 1)	12,141,846	1,665,932	13,807,778	236,248	1.7
1931 (Jan. 1)	13,108,830	1,775,837	14,884,667	1,076,889	7.2
1932 (Jan. 1)	13,814,166	1,748,639	15,562,805	680,930	4.3

*About 2.3 years. †About 0.8 year.

‡Two plants with a total of about 140,000 hp. previously considered manufacturing now allocated to public utilities.

Table II—Total Capacity of Waterwheels at Water-Power Plants in the United States

January 1, 1932

(Plants of 100 Hp. or More)

Division and State	Total — No. of Plants	Total — Capacity in Hp.	Public Utility and Municipal — No. of Plants	Public Utility and Municipal — Capacity in Hp.	Manufacturing and Miscellaneous — No. of Plants	Manufacturing and Miscellaneous — Capacity in Hp.
United States	3,355	15,562,805	1,603	13,814,166	1,752	1,748,639
New England	1,217	1,938,501	264	1,167,137	953	771,364
Middle Atlantic	584	2,302,160	249	2,060,720	335	241,440
East North Central	396	1,103,193	263	870,274	133	232,919
West North Central	198	765,262	151	654,086	47	111,176
South Atlantic	314	2,968,237	176	2,851,238	138	116,999
East South Central	51	1,363,678	37	1,237,359	14	126,319
West South Central	36	133,787	28	131,312	8	2,475
Mountain	243	1,215,605	190	1,196,063	53	19,542
Pacific	316	3,772,382	245	3,645,977	71	126,405

Table III—Rank of Ten Leading States

Installed capacity and per Cent of U. S. Total

Rank	State	Horsepower	Per Cent	Rank	State	Horsepower	Per Cent
1	California	2,407,034	15.5	7	Maine	612,561	3.9
2	New York	1,892,464	12.2	8	New Hampshire	558,822	3.6
3	Washington	1,011,306	6.5	9	Wisconsin	519,816	3.3
4	North Carolina	961,416	6.2	10	Georgia	512,459	3.3
5	Alabama	931,450	6.0				
6	South Carolina	809,978	5.2		Total	10,277,170	65.7

READERS' FORUM

Says Jacksonville Municipal Is Losing Money

To the Editor of the ELECTRICAL WORLD:

With reference to Mr. Anders' comment (March 12, page 508) on my article (January 30, page 239) may I reply that Mr. Anders begins his records in 1895, when the city of Jacksonville entered the utility business. He shows a gross revenue of $31,007,704.10 for the 36 years and states that the rates of privately operated companies in Florida today average 96.8 per cent higher than Jacksonville; upon this hypothesis he states that the municipal plant at Jacksonville has saved the citizens some thirty million dollars in the past 36 years. For 1930 the average return per kilowatt-hour for the Jacksonville plant was 3.85 cents for all classes of service. The 1931 average for all classes of service for the Florida Power Corporation was 2.88 cents. The same average for Augusta, Ga., was 2.45 cents and for Macon, Ga., it was 2.47 cents.

Following Mr. Anders' own line of reasoning, the reverse is, therefore, more nearly actually correct. During the period mentioned the citizens of Jacksonville have paid for electricity on the basis of these averages $11,274,401.20 more than the citizens of Augusta, $11,113,161.15 more than the citizens of Macon, $7,813,941.43 more than if they had bought at the average rate of the Florida Power Corporation.

The fact that $6,871,410 has been turned over to the city and that the city now owns a plant valued at $9,500,903.41 does not indicate at all that the city has made more than fourteen million dollars. The true status is arrived at when the six millions is analyzed to ascertain just what part of it went to pay interest and retirements upon the plant's own bonds. The writer has been nearly three weeks trying to get a statement of all utility bond issues since 1895 and has got nothing definite yet. A prominent auditor in Jacksonville who is familiar with the situation states that the city's bond records are so imperfect that it would require a month to get this information.

In considering the tax that would be paid by the Jacksonville municipal utilities it must be realized that practically all these investments lie within the corporate limits of the city of Jacksonville. Therefore, they pay full state, county and city taxes.

The greater part of the Florida Power Corporation, the private company to which Mr. Anders refers, lies in the wide open spaces and in counties where the millage and assessment ratios are relatively low. The taxes as computed in the original article were at present valuations at the existing millage of the city of Jacksonville, Duval County and State of Florida. These calculations show an annual loss to the taxpayers of this county of $484,550.

Mr. Anders' analysis of operation for 1930 in the tabulation of his reply is not far from the original presentation in the first three items down the column. His depreciation figures are a little less than the original, but that is due to his calculating a straight 5 per cent on electric and 2¼ per cent on water, while in the original article the rates were different for various classifications of the equipment and properties.

Mr. Anders only includes interest on outstanding bonds. He is wrong here, for if the people of Jacksonville are losing what the nine-million-dollar electric and the three-million-dollar water properties, in the form of cash or in interest-bearing assets, would bring in, they are losing at least $720,000 interest money each year by having this large investment tied up in these utilities.

The reply criticises the writer for using out-of-state private companies for comparison. Therefore, taking specifically the Florida Power Corporation: The excess the people of Jacksonville paid over that company's average for the year 1930 was $660,034, which if taken in the original tabulation shows the Jacksonville electric department in the red—$222,875.02.

Therefore at the rate of 1 mill, which equals $94,000 in taxes, the community supporting the Jacksonville municipal electric and water utilities is paying for the privilege an equivalent of 5.68 mills more than the Florida Power Corporation average.

It is significant to note that the Jacksonville electric plant, with its unusually favorable load factor of 43.7 per cent, receives an average of 3.85 cents per kilowatt-hour, while the Florida Power Corporation, with its low load factor of about 26 per cent, with hundreds of miles of transmission line selling to rural sections, small towns and no large cities, receives an average of only 2.88 cents per kilowatt-hour.

W. AUSTIN SMITH,
Consulting Engineer.

Jacksonville, Fla.

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Effect of Humidity on Insulator Flashovers

To the Editor of the ELECTRICAL WORLD:

I wish to comment on the article of G. M. Barrow in ELECTRICAL WORLD, March 5, 1932. I have had some experience which suggests to me a theory for increase of flashovers on insulators due to humidity, and also the fact that the sphere gap is not affected by the change in humidity.

When testing insulators made of glass, the same shape as the porcelain ones, a lower flashover is obtained. This lower flashover is due to the increased dielectric constant and, therefore, the air nearest to the insulator is overstressed. If we can lower the flashover by introducing a material of a higher dielectric constant we can also increase the flashover by introducing the porcelain insulator into a humid atmosphere, which has a resultant dielectric constant higher than air, and may be in some cases higher than the porcelain.

This is, in my opinion, one reason for the increased flashover due to humidity. I also believe that the absolute humidity is the one responsible for the increase of flashovers. In testing insulators, I have found that on short insulators the change in humidity has practically no effect on flashovers. The longer the insulator, the more effect the absolute humidity has upon the flashovers.

This suggests that the air is laden with moisture par-

ticles which line themselves up in the field so as to produce a multiplicity of condensers. This multiplicity of condensers is only effective in the part of the field that is uniform. Therefore on shorter insulators, where the field is not uniform, there is little effect of the moisture particles to increase flashover potentials, and on long insulators, that have a much longer uniform part of the field, the moisture content in the air has an effect. As we increase the humidity in the air the more condensers in series we get and the stronger the air, until a time when there are so many moisture particles that they touch each other, and this is the dew point at which the flashover potential falls down sharply.

As far as the effect upon the sphere gap is concerned, the following may explain the apparent lack of effect of humidity. When the sphere gap is put into an atmosphere laden with moisture the dielectric constant of the air plus the moisture is increased, and therefore the field becomes more uniform, the equipotential surfaces stretch out and, instead of a sphere gap of smaller dimensions, a sphere gap of larger dimensions is produced. If it were not for the fact that the moisture is being drawn into the most dense part of the field, which is on the center line of the spheres, the actual flashover of the spheres in moisture would be much higher. In other words, we get a resultant strength of the air when a sphere gap is put into a humid atmosphere, and this resultant strength appears to be very close to the original strength of dry air.

Delta-Star Electric Company,
Chicago.

JOSEPH C. RAH,
Consulting Engineer.

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BOOK REVIEWS

National Electrical Code Handbook

By Arthur L. Abbott. McGraw-Hill Book Company, New York. 435 pages, illustrated. Price, $3.

There has been a call for an authoritative and comprehensive interpretation of the National Electrical Code. This book meets that requirement admirably. Profusely illustrating methods of execution, it also reveals the intent and purpose of the code rules as well as the reasons for their detail and rigidity. It is so complete a working guide that it may well relegate the code itself to the status of a last court of reference.

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Photo-electric Phenomena

By Arthur Llewelyn Hughes and Lee Alvin du Bridge. McGraw-Hill Book Company, New York. 506 pages, illustrated. Price, $5.

Results of photo-electric research have assumed prodigious proportions in literary production scattered through many volumes of many journals. Those who desire a comprehensive and logical assembly of phenomena, hypotheses, technique and application will find it in this book. Free of opinionation, copiously supplied with references to substantiating sources, it not only gives the application engineer an adequate background for his activities but should save the explorer many tedious hours in searching the literature for past studies and clues to the unsolved areas.

There are chapters on energy and spectral distribution, selectivity, emission, ionization, photo-conductivity and photo-voltaics, also a chapter on technique and application. One distinctly noteworthy feature is the inclusion with the graphical results of cited experiments of a diagrammatic sketch of the apparatus used by the investigator. Another is the helpful tabulation of the values found in various researches for the indices of photo-electric behavior.

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Spon's Electrical Pocket Book

By W. H. Molesworth. E. and F. N. Spon, Ltd., London, England. 401 pages, fourth edition. Price, $2.50.

The new edition of this reference book has been revised and chapters on radiation included. It is a practical handbook of tables, units, measurements and tests for electrical engineers.

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Power Plant Management

By Walter N. Polakov. McGraw-Hill Book Company, New York. 171 pages, illustrated. Price, $2.

The subject of this book is one to which the author has long devoted his attention and consulting practice. It embodies some of the principles and practices which he has suggested to his clients, but the author warns that the sample instructions and case analyses should be taken only as suggestive of what can be done and are not fully applicable in every case. Among the topics covered are executive functions and duties of power plant superintendent, chief operating engineer, head fireman, plant clerk, record man, steam and power dispatchers and maintenance man. Discussion of work schedules, repair records, inspection and care of instruments, fuel utilization charts, time keeping, substores, idle expense records, power expense classification, task work with bonus and betterment recommendations occupies nearly half the book. The appendix contains abridged case reports describing results obtained by applying the principles and practices suggested.

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Fractional-Horsepower Motors

By A. H. Avery. Isaac Pitman & Sons, New York. 152 pages, illustrated. Price, $2.25.

This is a practical book dealing with the design, insulation and testing of fractional-horsepower motors. It is based upon English practice and covers this important type of motor very adequately.

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Advanced Electrical Measurements

By William R. Smythe and Walter C. Michels. D. Van Nostrand Company, Inc., New York. 234 pages, illustrated. Price $3.

Beginning with a chapter on errors and use of observational data, the book then presents 50 laboratory experiments for the senior student in electrical engineering, vacuum-tube physics and electrolytic chemistry. Bridge, potentiometer and electrometer measurements are followed by those in thermionic tube circuits, gaseous discharges, electro-thermometry and electrolytics.

Men of the Industry

W. I. Middleton Retires

Walter I. Middleton has retired from the position of chief electrical engineer of the Simplex Wire & Cable Company, which he has filled with distinction since 1903, attaining a notable reputation for original contributions to the art of cable manufacture and application. His early career included service with the General Electric, Westinghouse and Chase-Shawmut companies as a construction and installation engineer.

Since joining the Simplex organization 29 years ago he has been in charge of engineering in the factory at Cambridge, Mass., and for the sales department. He was instrumental in developing the sine wave generator, paramount in importance to those interested in cable technology; the peak-reading voltmeter, a formula for figuring electrostatic strains in cable, and he pioneered the deep oil well cable and the all-rubber cable design for mining service. During his administration the company's new high-tension laboratory was built at Cambridge and close co-ordination established between the chemical and physical aspects of cable research in the Simplex company.

In his outside professional activities Mr. Middleton played a leading part in the advancement of cable engineering on a world-wide scale. He is a founder of the Insulated Power Cable Engineers Association, which is composed of the foremost specialists in this field in the United States. For the American Engineering Standards Committee he has been chairman of a technical committee preparing specifications for metallic coverings for power cables and was also a member of the technical committee on varnished cambric insulation. In the National Electric Light Association he has been active in the underground systems committee and was a member of the committee on cable testing. He has also been a member of the American Institute of Electrical Engineers and has published many papers before that body and in the technical press.

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H. M. CAMERON, who has been associated with the editorial staff of the ELECTRICAL WORLD for the past six years, has joined the Fundamerican Corporation, New York, in the capacity of vice-president. Mr. Cameron will also serve as a member of the board of directors.

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T. H. UNDERWOOD, who was in charge of the construction of the new transmission line and substation which has just been completed by the Standard Management & Operating Corporation of San Francisco for the Coast Counties Gas & Electric Company, has been transferred to the Coast Counties company as assistant electrical engineer in charge of construction and maintenance, with headquarters in Santa Cruz, Cal.

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HAROLD V. BOZELL, formerly editor of the ELECTRICAL WORLD and more recently identified with Bonbright & Company, Inc., with headquarters in New York, has been elected executive vice-president and a member of the board of directors of the Associated Telephone Utilities Company.

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CLARENCE L. LAW, general commercial manager of the New York Edison Company, has been appointed to a similar position with the United Electric Light & Power Company of New York. Mr. Law began his career with the New York Edison Company in 1906 as special inspector in the contract and inspection department and subsequently has served as manager of the bureau of illuminating engineering in the same department, as assistant to the general commercial manager and assistant to the vice-president of the Yonkers Electric Light & Power Company and assistant to the vice-president, commercial relations, New York Edison Company. It was in 1929 that he was appointed general commercial manager. Mr. Law is actively identified with the Illuminating Engineering Society, National Electric Light Association, Empire State Gas and Electric Association, American Institute of Electrical Engineers and the Association of Edison Illuminating Companies.

W. A. Buttrick Heads New England Division

William A Buttrick was elected president of the New England Division of the National Electric Light Association, at the annual meeting last week in Boston, to succeed W. C. Bell at the close of the association year. Mr. Buttrick has been president of the Twin State Gas & Electric Company, with headquarters at Boston, since the fall of 1920 and is widely known in utility circles. After some years of varied business experience he entered the employ of Stone & Webster in 1904 and was assigned to the Cape Breton Electric Company, Ltd., at Sydney, N. S., with duties in the meter and accounting departments. The next year he was transferred to the Columbus (Ga.) Railway Company, predecessor of the Columbus Power

Company, as assistant to the manager. In 1907 he was appointed superintendent of the Pawtucket (R. I.) Electric Company, going to the Baton Rouge (La.) Electric Company as resident manager. Returning to the North in 1911 he became manager of the newly organized Adirondack Electric Power Corporation with offices at Glens Falls, N. Y., going to the Boston office of Stone & Webster in 1918.

In March, 1919, Mr. Buttrick joined the Insull organization at Chicago as an executive assistant in the Middle West Utilities Company. Eighteen months later he became head of the Twin State property. He is also president of the Central Vermont Public Service Corporation and of the Berwick & Salmon Falls Electic Company of Maine, a vice-president and director of the New England Public Service Company, director of the Public Service Company of New Hampshire, and a director and member of the executive committee of the Central Maine Power Company. Mr. Buttrick's reputation as an executive is based upon leadership in commercial development, notable economies in the use of capital and in operation and the cultivation of excellent employee and public relations throughout the widely scattered properties under his jurisdiction.

R. W. SHOEMAKER, formerly electrical engineer and superintendent of the electrical department of the Turlock Irrigation District, Turlock, Calif., a position which he relinquished to join the Electric Bond & Share interests in Rio de Janeiro, has returned to San Francisco after a two years' stay in Brazil.

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WILLIAM M. MARTIN has been appointed manager of the Capitol division of New York Power & Light Corporation to succeed J. G. Menut, resigned. Mr. Martin has been general superintendent of the division, which includes the Albany, Troy and Hudson districts, since March, 1930. He joined the New York Power & Light organization in 1928 as assistant superintendent of power plant operations. Just prior to that time he had been connected for four years with the Monongahela-West Penn Public Service Company, first as general district superintendent of that company's properties in West Virginia and Maryland and later as manager of the Parkersburg - Marietta division with headquarters at Parkersburg, W. Va. Previous to this he was with the West Penn Power Company for three years as division manager of its West Virginia and Maryland properties.

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EDWIN J. BOOTH, JR., has been elected a director of the Central Indiana Power Company to succeed Samuel Insull.

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OBITUARY

HARRY S. WHITING, district sales manager of the San Francisco district, Aluminum Company of America, died in San Francisco, March 9, following a heart attack.

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E. WARD WILKINS, who manufactured some of the earliest electrical inventions of Thomas A. Edison, died in Philadelphia, following an operation. He was 71 years of age. A native of Philadelphia, he was one of the founders and at the time of his death was president of the electrical manufacturing house of Patrick & Wilkins. Mr. Wilkins was a charter member of the Electrical Association of Philadelphia.

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ALBERT EMANUEL, retired public utility operator, died March 30, at his residence in New York, after an illness of several years. He was 62 years of age. Mr. Emanuel's outstanding achievement in the public utility field was the assembling of the various properties that in 1923 became the National Electric Power Company, which was purchased by the Insull interests in Chicago in 1927. Since that time, owing to his failing health, he had not been active in business. Mr. Emanuel was born in Richmond, Ind. After admission to the Ohio bar he practiced law in Dayton for some years before removing to New York in 1916.

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HENRY A. BLAIR, president of the Chicago Surface Lines, died February 15, of bronchial pneumonia, in that city. Mr. Blair was one of the notable group of four who managed Chicago traction properties during the last quarter of a century. He had, in addition, many financial interests besides the transportation field, having served on the directorate of the Commonwealth Edison Company, the Public Service Company of Northern Illinois, Continental Illinois Bank & Trust Company and the Elgin National Watch Company. He was 79 years of age.

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GEORGE LUTHER, formerly branch manager for the Electric Storage Battery Company, Seattle, Wash., died in Chicago, February 9, after a short illness.

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THOMAS FOULKES, founder of Foulkes Electric Company, Los Angeles, Calif., and one of the pioneers in the electrical industry in the West, died in southern California recently. In the early nineties he was chief engineer of the lighting plant of the city of Pasadena, then owned by L. C. Torrance. In 1896 he started an electrical contracting business in Pasadena, later moving his place of business to Los Angeles. The present business there bearing his name and headed by his son, Roy T. Foulkes, is the outgrowth of that start. Mr. Foulkes was the first president of the Los Angeles Board of Public Utilities. He was a member of the American Institute of Electrical Engineers at the time of his death.

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GEORGE FREDERICK SEIBEL, manager of the Taunton, Mass., municipal lighting plant, died March 1 at his home in that city. Mr. Seibel was born in Rochester, N. Y., 76 years ago. Early in life he was engaged in the construction engineering business with his father. Later Mr. Seibel became engaged in street railway electrification, working on the street railways in Lowell, Lawrence, Haverhill, Fall River and Taunton, Mass. For a time he was operating engineer for the Dighton, Somerset & Swansea Street Railway Company. He next became connected with the Eastern Massachusetts Street Railway Company, first as assistant general manager and later as chief engineer of construction. For the past twelve years he had been manager of the Taunton electric plant.

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CAMPBELL WALLACE, for eleven years secretary of the Georgia Public Service Commission, died at his home in Atlanta March 27. A native of Marietta and a graduate of the University of Georgia, he had practiced law for many years. He was one of the original members of the old Georgia State Railroad Commission, which later became the Public Service Commission.

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MAX TOLTZ, a prominent consulting engineer, with offices in St. Paul, Minn., died at his home in that city January 11. A native of Koeslin, Germany, and a graduate of the Royal Polytechnikum in Berlin, he served a short apprentice with a Berlin firm before removing to the United States in 1882. The first 25 years spent in the United States he devoted to the development of railroads, especially in the Northwest. In 1910 he organized the Toltz Engineering Company of St. Paul, of which he was president, an office which he held also in the successor company, Toltz, King & Day, Inc., formed in 1918. Mr. Toltz retired from active business in 1928. He had been active in representative associations, including the American Institute of Electrical Engineers, American Society of Mechanical Engineers and other similar organizations.

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HARRIS T. LUSCOMB, manager of the commercial engineering bureau, contract and inspection department of the New York Edison Company, died March 23 at his home in Garden City, L. I. Mr. Luscomb entered the employ of the company as a special inspector in the contract and inspection department in 1908, directly upon receiving his degree of electrical engineer from Columbia University. Among his early duties was the introduction of the tungsten lamp to the public. In 1909 he was assigned to the wholesale bureau in charge of engineering and about a year later went with the newly organized commercial engineering bureau. A few years later Mr. Luscomb was appointed general engineer of the contract and inspection department in charge of the commercial engineering bureau, which handles technical features of the activities of the department in its relations with the public and other departments of the company. Mr. Luscomb was widely known for his committee work in connection with the National Electric Light Association and other similar organizations. He had been particularly active as chairman of the heating research committee of the National District Heating Association.

Trade News

Stibloy Products Buys Liquid Metal Products

The Stibloy Products Company, Inc., with principal offices in the Koppers Building, Pittsburgh, has taken over the assets of Liquid Metal Products, Inc., Chicago, producer and distributor, under the Arent patents of Stibloy, a metal compound in liquid form, which acts as a primary coating to hold paint, enamel and lacquer tenaciously, permitting immediate finishing of new galvanized metal surfaces.

Offices of the Stibloy Products Company, Inc., control of which has been acquired by the Koppers Products Company, are: President, J. N. Forker; vice-president, S. H. Bell; secretary, John D. Shaner, and treasurer, S. T. Brown.

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Bailey Meter Company of Cleveland has just issued its bulletin No. 112, describing Bailey boiler water level recorders. The bulletin describes the method for obtaining records of the true water level throughout the full range of the drum.

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Lincoln Fixture Manufacturing Company of Canada, Ltd., has been established in Montreal, with a plant located on Dock Street. The company will manufacture the same type of product as that produced by the Lincoln Fixture Manufacturing Company of Detroit. S. L. Sneirson is president of the company and L. M. Naimer vice-president. F. G. Smith is secretary-treasurer.

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A new four-page engineering design folder on laminated phenolic products has been issued by the Spaulding Fibre Company, Inc., of Tonawanda, N. Y. While largely devoted to technical data, the folder also contains general information of value to users of laminated phenolic materials.

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Columbia Electric Manufacturing Company of Cleveland, manufacturer of generators, motor-generators and tank rheostats for plating industries, has organized an electrochemical division to handle a complete line of polishing and plating equipment and supplies, under F. G. Cyrex.

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James R. Kearney Corporation has appointed Carl J. Spindler its representative in the Illinois, Wisconsin, Michigan and Indiana territory. He will replace H. C. Fiske, who has been appointed assistant chief engineer with headquarters in St. Louis. Mr. Spindler's first position following graduation from the University of Illinois was with the Illinois Traction System at Peoria in the valuation and rate department. He later moved to Chicago with the Illinois Power & Light Corporation as assistant valuation and rate engineer. In 1926 he joined the Copperweld Steel Company as representative in the Middle West territory.

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C. E. Chatfield has resigned as Chicago manager for the Lapp Insulator Company to start a sales agency at Indianapolis with office at 712 Illinois Building.

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The Ivanhoe division of the Miller Company of Meriden, Conn., has just issued a new 62-page catalog of commercial lighting glassware and fixtures, No. 820. This catalog illustrates all of the standard items as well as many new items added recently. The duo-purpose ultraviolet lighting equipment for both type S-1 and type S-2 "Mazda" sunlight lamps is a feature.

Star Electric Motor Company announces the removal of its manufacturing plant and office to Bloomfield Avenue and Grove Street, Bloomfield, N. J.

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"Selling the Peaks" is the title of the third series of articles published by the Sangamo Electric Company, Springfield, Ill., devoted to increasing the effectiveness of load-building programs.

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American Brass Company has just published a new condenser tube booklet specifically the properties and service records of Anaconda super-nickel and "Ambrac" condenser tube.

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Apex Electrical Manufacturing Company reports for the year ended December 31, 1931, net profit of $157,549 after depreciation, federal taxes, etc., equal to $1.05 a share after preferred dividends. Earnings for 1930 amounted to $1.83 a share on common stock. Current assets at the end of December totaled $1,410,767 and current liabilities $227,396.

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Worthington Pump & Machinery Corporation has appointed Frank R. Wheeler, special sales representative, with headquarters at the Chicago office, to cover the Midwest territory assisting the Worthington organizations in Chicago, St. Paul, Kansas City, St. Louis and Detroit.

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WELDING A NEW STYLE BRIDGE FLOOR

Electric welding has enabled another advance in fabricating practices. The flooring of the new Boston Bridge near Pittsburgh, Pa., is made up of sections of "T-Tri-Lok," a Carnegie Steel Company product which makes possible a saving of half the weight of the usual bridge floor. It was installed, fastened to the bridge girders by arc welding, using Westinghouse "FlexArc" welders and "FlexArc" electrodes.

New Equipment Available

Surge-Proof Distribution Transformers

A distribution transformer which will not be injured by lightning surges entering either the primary or secondary windings is announced by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The protection of this transformer is independent of external connections or ground resistance. "Deion" surge protective gaps are placed inside the transformer tank and so connected to the windings as to limit the voltage stress that can exist between these windings and the core and case. With this protection no voltage stress higher than a predetermined safe value can exist upon any part of the transformer insulation. Fuse outages due to lightning surges are eliminated.

The transformer is universally applicable to any type of distribution system, to any system of transformer connections, either single phase or three phase, and for any grounding practice desired. It is suitable for rural lines as well as for city distribution.

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BALANCED PLUNGER VALVES designed for the field of water works and hydroelectric power generation to assist water-works engineers in solving some of the difficult problems met in handling water at high velocity through long pipe lines and to eliminate dangerous pressure surges and water-hammer conditions, are announced by the Baldwin-Southwark Corporation, Philadelphia. The Larner-Johnson internal-cylinder, balanced-plunger principle is employed in the design.

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A NEW WATER COOLER made in both the pressure and bottle type has been placed on the market by the Westinghouse Electric & Manufacturing Company. The motor and compressor are inclosed in a hermetically sealed shell of steel and lubricated by a permanent supply of oil. Its mechanism is quiet. The Westinghouse built-in watchman is incorporated, insuring a trouble-free operation, automatic under all normal and abnormal conditions.

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A HITEMETER IN A SIMPLIFIED FORM, known as the Kearney Seelye "Hitemeter," is announced by the James R. Kearney Corporation, St. Louis, Mo. There are no spirit levels, plumb-bobs or other intricate parts to get out of adjustment. There are no calculations to make, all readings being direct. The "Hitemeter" is of a convenient pocket size with an attractive, durable finish and is furnished in a leather case.

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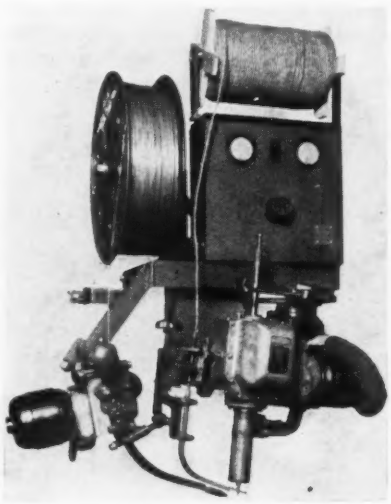
Shielded Arc Welding Becomes Automatic

A wire feeding head which allows automatic arc welding with the shielded arc process has been developed by the Lincoln Electric Company, Cleveland, Ohio. The result claimed for this head is high-speed operation on either butt, fillet or building-up welding, the deposited metal having physical characteristics equal to or better than mild steel. Continuous filler metal is obtained from a reel mounted on the head and fed into the arc just in front of the arc travel.



Means are provided for varying the rate at which the filler metal is fed into the arc so that the amount of metal deposited can be varied to meet the conditions demanded by the speed of the head and the type of weld being made.

Since the rate at which the filler can be fed is varied independent of the speed of the head travel, only one size of filler metal is necessary for any type of work within the range of the machine. The filler metal is usually in strip form, which insures greater accuracy in feeding the metal into the arc. Since the welds are made in a shielded arc the physical characteristics are similar to those obtained by other shielded-arc methods. The manufacturer states that the range of applications of this type of automatic covers practically all fields where arc welding is applicable.

Oil-Filled Capacitors in Handy Unit Form

Reverting to the handy and economical unit form whereby any desired combination may be assembled for given capacity or kva. requirement, the Dubilier Condenser Corporation, New York, has introduced its a.c. oil-impregnated, oil-filled capacitors. Each capacitor comprises a semi-compressed section, permitting free circulation of oil to all parts for maximum dielectric strength, placed in an oil-filled container that is fully sealed against leakage. The Dubilier design of welded steel clamping members insures uniform yet moderate dielectric compression for the section and eliminates all of the usual difficulties and condenser failures experienced with compressed designs in a.c. circuit operation. The terminals are on one side, for easy wiring. In practice, the units may be employed singly or in groups, placed on shelves or mounted on any equipment, or again placed in large steel cans.

The Dubilier a.c. oil condensers are available in working voltages up to 660 and in a wide range of capacities. They are especially desirable for capacitor motors and for general power-factor correction.

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Metal-Clad Switching Unit for 4,100-Volt Lines

A metal-clad switching unit with main and transfer bus to control 4,100-volt, three-phase feeder circuits equipped with three single-phase regulators is announced by the Delta-Star Electric Company, Chicago, Ill. Interlocks make it possible to energize the feeders one way only and convenient means are provided for putting the regulators in or out of service, insuring ready inspection or adjustment.

By means of a portable truck the main and regulator breakers can be quickly removed or placed in service. The entire unit inclosing the oil circuit breaker and auxiliary equipment is of the fabricated-steel-welded type.

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COMBINATION METER SWITCH with provisions for range and lighting circuits is announced by Cutler-Hammer, Inc., Milwaukee, Wis. It is of the sealable main fuse type and is arranged for the new meter sequence connections —meter is connected ahead of the switch and fuses. The service switch and main fuses are in a separate sealable compartment at the top. The lower compartment contains the lighting circuit fuse panel and safety type range fuse pull-out.